EXHIBIT A

PATENT
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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Reissue Application of :
BILL L. DAVIS and JESSE S. WILLIAMSON

For Reissue of U.S. Patent 5,630,393
Issued May 20, 1997
Serial No. 08/515,097

Filing Date: May 20, 1999

Serial No: 09/315,796

For: COMBINED LITHOGRAPHIC/ FLEXOGRAPHIC PRINTING APPARATUS AND PROCESS

Group Art Unit: 2854

Examiner: S. Funk

SUPPLEMENTAL DECLARATION OF RAYMOND J. PRINCE

I, Raymond J. Prince, under penalties of perjury declare and state the following:

1. I am the same Raymond J. Prince who made a declaration in May 1999 submitted with the original application for reissue, and reaffirm the statements made therein.

2. I have been asked to review once again U. S. Patent 5,630,363, specifically in reference to an office action in reissue application Serial No. 09/315,796, as well as European Patent Application EP 741 025 - A2 cited in that office action, and give my opinion as to its teachings to one of ordinary skill in the printing arts and respond to specific questions concerning (1) the teaching of the sentence of col.1. line 54-55 :"Many sheetfed presses can perfect (print both sides of the paper) in one pass through the press." as that sentence impacts the scope of the invention taught to the printing artisan, and (2) the correct interpretation of the term "over" in the specification and claims. In addition I have been asked to explain the meaning of the statement "continuous in-line process" and the printing terms "perfecting", "perfector", "perfecting press", "overcoating", " on top of", and "overprinting". Finally, I have been asked to give my opinion concerning the adequacy of each of the '383 patent claims being reissued and the impact as to patentability of EP 741 025 - A2 concerning claims 1 - 87 sought to be reissued as originally filed. This document is intended to supplement my first Declaration of May 1999.

3. I have received a portion of an office action in the captioned application and understandings dated February 8, 2000 concerning a rejection of claims 44 - 87 under 35 U.S.C. section 251 as allegedly lacking support in the specification, attached hereto as Exhibit A. I have also reviewed reissue applicants originally filed reissue claims as filed 1-87, Exhibit B. **For the reasons that follow in paragraphs 4 -10 below, I disagree with the examiner's conclusions in Exhibit A, and conclude claims 1-87 are supported by the specification of the '363 patent being reissued.**

4. The terminology of the printing industry has gone through many changes in the past 500 years, it can get a bit complex to the lay person with words having many meanings depending on how they are used.

(A.) "Perfecting" means to print on both sides of the sheet or web in on pass through the press. Most web presses sold today and in the last 20 years are perfecting presses. These presses operate using a blanket to blanket cylinder approach. Therefore every time the word web is used in '363 patent it means a "perfecting process".

(B.) Press manufacturers will refer to a "perfecting press" by the number of colors, and where the perfecting unit is. A 6-color press with the perfecting unit between units 2 and 3 would be referred to as a "2 over 4 unit". It can print 2 colors and turn the sheet and print 4 more colors. One can purchase 1 over 5 presses as well as 2 over 2 presses and just about every combination one can think of.

(C.) Another way of expressing the above (B.) is to describe a 6- color press with a "perfecting" unit between units 2 and 3 would be to state is as a "2/4 press".

5. The term " single in-line continuous printing process" in the '363 patent also refers to a "perfecting press". A prime example is a web offset press, which prints on both sides of the web of paper, that begins with a roll of paper and ends with a folded signature of final product. It may also refer in a sheetfed plant to a perfecting press in which unprinted paper is fed into the press and a sheet printed on both sides is delivered. A press that cannot print on both sides in one pass is not a "single in-line continuous printing process".

6. Based on the above teachings of "perfector", together with the teachings of printing "over" and "single in-line continuous printing process", claims 44 -87 of the '363 reissue application are based on a perfecting press as described in '363, and are well supported by the teachings of the '363 patent.

7. The term "overcoating" can be used with a press that does "perfect" as well as with a press that does not "perfect". The term means to apply a material/coating over a previously applied material. Printing "on top of" is synonymous with "overprinting" -- printing on the same side of -- which is a subset of printing "over" in which the second or downstream unit can also print on the reverse side of the substrate.

8. In column 4 lines, 29 and 43 of the '363 patent, reference is made to printing an image "over" a previously printed image. In column 4 line 38 of the '363 patent overcoating can apply to a perfecting press or a non- perfecting press, the preferred method would be to accomplish this on one pass through the press (a in-line continuous printing process), a perfector. Generally when the term "overcoating" is used in the art, it is used to describe the use of a final coating of a gloss, dull or matt water based or UV coating to improve finish (visual) and or rub resistance.

9 In reviewing column 7, lines 52-60 of the '363 patent, the language "on top of" is only describing one way printing works, using reissue applicants process. This is the same on a "perfecting" or non-perfecting press.

10. In independent '363 claims 44,53,55,58,60,72,82 and 86 use the terminology "thin controlled layers". This terminology is merely referring to ink or coatings, i.e. images. One skilled in the art would know they are synonymous.

11. I have also been asked to review the process aspects of EP 741,025A2 ('025") in conjunction, and rejections, of claims 1 - 87 based on anticipation (35 U.S.C sec 102) and obviousness (35 U.S.C. sec 103) by the examiner, in the same office action, the pertinent portion attached hereto as Exhibit C. I understand that the examiner believes the invention of reissue claims 1-6, 9-20, 22-25, and 28-38 are taught by the '025, i.e. "anticapated", and the remaining claims "obvious". I understand a publication is anticipatory if it puts one of average skill in the art in possession of the claimed intention at the time of (filing date) of the claimed invention. I understand that a referral make a claims invention obvious if the claimed invention as a whole was obvious to perform or to do as of the filing date of the claimed invention. **I strongly disagree with the examiner and I found claims 1 - 87 cannot be anticipated or made obvious by the '025 even if it is prior art (which I cannot see how, the '025 was published in late 1996 and the filing date of the '363 is in 1995).** In examining EP 0 741 025 A2, I conclude:

(1.) There is no reference to "perfecting" in the '025;

(2.) The '025 application refers to "overprinting" which is not "perfecting", and which is not synonymous with "printing over";

(3.) There is no mention of a "single in-line continuous printing process" in the '025;

(4.) The '025 application expounds the cantilever approach and its design rather than a process-- the cantilever design has been in use throughout history, and I find it hard to believe that valid cantilevered apparatus claim's for the particular cantilever disclosed could be an issue in any industrial country;

(5.) Cantilevered coaters, as described in the '025 and variations thereof, was traditionally placed at the end of a presses as of 1995, not between units;

(6.) The '025 application would not even as of May 1995 adequately describe or enable one in the art to teach the '363 process. It does not adequately teach the '363 process, give a background as to the problems in the art, i.e. the problems with the WIMS patent listed below, nor does it provide the process. Further, benefits as does the'363 patent, it therefore, in my opinion, does not place the artisan in 1995 in possession of the '363 invention. Specifically, while column 2 lines 40-45 of the EP 0 741 025 A2 suggests that a flexographic unit could possibly be placed ahead of a lithographic unit, the application does not spell out any benefits -- there is no appreciation shown for doing flexography first--, in fact, the first part of col. 2 of EP 741 025 A2 specifically indicates that the cantilevered device can be put at the <u>last</u> unit, as it was done traditionally, or between units, which has a dramatically different effect. Absent (a) being taught the benefits of performing flexography first (see, e.g., col. 4, lines10 - 20 and col. 6, line 37 - col. 8, line 27 in the Davis et al.'363), and the problems those benefits solved (see columns 3, and 4, lines 1-9 of the '363 and (b) knowing about the reissue applicants assignees prior "WIMS" patent U.S. 5,370,976 (incorporated by reference in the '363 patent at col.8, line 11), the artisan would <u>not</u> have had any motivation to try flexography prior to lithography in 1995 -- there is no reasonable expectation of reissue applicants' success. Moving a rack-back up front in the lithographic press in 1995 was an expensive undertaking. Moreover, in 1995 flexography was regulated generally to lower quality work in the industry and if combined with lithography it was placed at the end of the press to apply coatings and in rare instances metallic pigment in suspension in a waterbased coating. The flexography units in commercial use could not be physically placed between units due to size, without expensive modification. Further, the so-called "rack backs" available in 1994 or early 1995 for flexographic use were designed strictly for end of press installation. In addition there was

no technical reason indicated in the '025 application to place one or more flexo units between or ahead of lithographic units due to quality. The WIMS '976 patent is not mentioned, let alone incorporated by reference in the '025. Recently there has been great progress in the flexographic process and in particular the quality of plates and inks as well as coatings. Today flexography is capable of very high quality work. Many wine labels as well as high quality flexible packaging for example potato chip bags are now done by the flexographic process. This quality was not generally available in mid 1995; and

(7.) About 90% of the '025 patent publication is devoted to the teaching of the design of the cantilevered device, <u>not</u> a process. The teaching of the <u>process</u> is inadequate. The remainder of the publication does not instruct unequivocally the artisan how to perform reissue applicants process or provide benefits. It throws out to the reader is an opportunity to try it, without reason or motivation. Absent a teaching of reissue applicants found benefits and an incorporation of WIMS U.S. Pat. 5,370,976, and interpretation of the '025 patent as teaching claims 1-6, 9-20, 22-25 or 28-38, it is an exercise in sheer hindsight -- it is reading the '025 patent not as one in the art would have read it on May 4, 1995 (the '025 priority date), but in 1997 or later with the '363 in front of the printer. The '025 does not teach the benefits of the '363 process -- bizarre in my opion in 1995 unless someone knew about it. It does not mandate using flexography first -- a fatal shortcoming in view of the fact it does not mention, let alone incorporate WIMS U.S. Pat. 5,370,976. 90% of the '025 teaching is about a cantilevered apparatus, the type of which was already in the art. No mention is made of the use of halftones. There is inadequate teaching of the use of blanket cylinders. I disagree that the teaching of claims 11-20 or 22-25 or 28 exists in the '025 in hindsight, ignoring the shortcoming of lack of incorporation of WIMS '976 and the outstanding results in reissue applicants process. In my opinion claims 7-9, 11-28 and 39-87 are clearly not taught, even in hindsight. Most importantly because of the failure of the '025 applicants to teach the benefits of the '363 patent and because of the failure to incorporate by reference WIMS '976, one skilled in the printing art is not in possession of even broad claims 1-6, 10, or 29-38 as of May, 1995. Such a reading would be pure hindsight.

The undersigned declares further that all statements made herein of his own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application of any reissue thereon.

Raymond J. Prince

3/15/2000

Date

Supplemental Prince Exhibit A

Claims 42 - 87 rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

First, in each of independent claims 44, 53, 55, 58, 60, 72, 80 - 82, and 85 - 87 and dependent claims 42, 43, and 49 the recitations of printing on "both sides, opposite sides, or the reverse side" of the substrate is not supported by the original disclosure. Other than the brief mention of perfector printing in column 2 lines 54 - 55 with respect to prior art sheet fed presses there is no other discussion of perfector printing or printing on opposite, both, or the reverse side of the substrate in the original disclosure. Furthermore, the terms "over" and "on top of" are used interchangeably in the specification and in no instance is it implied that sometimes the

term "over" refers to perfector printing. Specifically, the meaning of the term "over" in context in column 4 lines 29 and 43 (applicant's declaration incorrectly refers to column 5) is no different than the context meaning of "over" in column 4 line 38 (again the declaration incorrectly refers to column 5) and column 6 line 3. Applicant's apparent argument that the use of this term with "overcoating" in the latter two instances clearly implies on the same side of the substrate but the first two instances of "over" with reference to "color images" implies perfector printing is without merit and self serving. Note original claims 29 and 34 in the parent application and column 7 lines 52 - 60 which state that additional "colored ink images" are printed "on top of" the previously printed image, thus, referring to printing on the same side of the substrate which contradicts applicant's assertion. Additionally, the use of the term "over" does not have any connotation of perfector printing in the art without being first preceded by "turning" or "flipping" and only with specific reference to the substrate. Lastly, the Declaration of Raymond J. Prince provides no objective evidence that the term "over" can refer to perfector printing and none of the exhibits provided in this declaration use the term "over" with respect to perfector printing.

Second, in independent claims 44, 53, 55, 58, 60, 72, 82, and 86 the terminology of applying "thin, controlled layers" to the substrate has no support in the original disclosure and, furthermore, has no clear scope or meaning.

Claims 42 - 87 are rejected under 35 U.S.C. 251 as being based upon new matter added to the patent for which reissue is sought.

Supplemental Prince Exhibit B

Reissue of U. S. Patent No. 5,630,363

CLAIMS

Note: Bracketed material in the following claims has been deleted from U. S. Patent 5,630,363 as issued; underlined materials, including new claims 42-84 has been added.

1. Apparatus for a combined lithographic/flexographic printing process comprising:

a substrate;

a plurality of successive printing stations for printing color images on the substrate in a continuous in-line process;

one of said stations comprising a flexographic printing station for printing a liquid vehicle image on said substrate with a slurry containing an encapsulated essence using the flexographic process;

at least one of said successive printing stations being a lithographic printing station; and

an overcoating applied over the liquid vehicle image on the printed substrate at at least one of said successive lithographic printing stations using the lithographic process in said continuous in-line process.

2. Apparatus as in claim 1 wherein said overcoating is an aqueous overcoating.

3. Apparatus as in claim 1 wherein said overcoating is an ultraviolet ink overcoating.

4. Apparatus as in claim 1 wherein:

said substrate is a paper sheet; and

said apparatus includes a sheet feeder.

5. Apparatus as in claim 1 wherein:

said substrate is a web; and

said apparatus includes a web feeder.

6. Apparatus for a combined lithographic/flexographic printing process comprising:

a plurality of successive printing stations for printing color images on a substrate in a continuous in-line process;

one of said stations comprising a flexographic printing station printing an aqueous-based vehicle image using the flexographic process to form a metallic coating;

a suspended metallic material being included in said aqueous-based vehicle image; and

at least one of the successive printing stations comprising an offset lithographic printing station printing a color image over the aqueous-based vehicle image using the offset lithographic process in said continuous in-line process.

7. Apparatus as in claim 6 wherein said suspended material includes uniform-sized metal particles to form said metallic coating.

8. Apparatus as in claim 6 wherein said suspended material includes nonuniform-sized metal particles to form said metallic coating.

9. Apparatus as in claim 6 further including: said flexographic printing station including a plate cylinder having a flexographic plate thereon, a blanket cylinder, and an impression cylinder;

a flexographic plate image transferred from said plate cylinder to said blanket cylinder, said image being formed of said metallic coating, said blanket cylinder transferring said metallic coating to said impression

cylinder for printing said flexographic plate image on said substrate; and

an anilox roller associated with said flexographic plate for supplying said aqueous-based vehicle containing said suspended metallic material to said flexographic plate.

10. Apparatus for creating a combined lithographic/flexographic printing process comprising:

a plurality of successive printing stations for printing color images on a substrate in a continuous in-line process;

one of said stations comprising a flexographic printing station for printing a first color image using the flexographic process; and

at least one of the successive printing stations comprising an offset lithographic printing station for printing a second color image over the first color image using the offset lithographic process in said continuous in-line process.

11. Apparatus as in claim 10 further including:

said flexographic printing station including a plate cylinder, a blanket cylinder, and an impression cylinder;

a flexographic plate on said plate cylinder;

an anilox roller associated with said flexographic plate for supplying a first color to said flexographic plate to form said first color image; and

said blanket cylinder receiving said first color image from said plate cylinder and transferring said first color image to said impression cylinder for printing on said substrate.

12. Apparatus for creating a combined lithographic/flexographic printing process comprising:

a substrate;

a plurality of successive printing stations for printing color images on the substrate in a continuous in-line process;

at least two successive ones of said printing stations being flexography stations and comprising:

(1) a supply of liquid coating;

(2) a plate cylinder associated with a blanket cylinder, said plate cylinder having a flexographic plate thereon;

(3) an anilox roller associated with said liquid supply coating and said plate cylinder for delivering said liquid coating to said flexographic plate to form an image for transfer to said blanket cylinder;

(4) an impression cylinder for receiving said liquid coating image transferred from said blanket cylinder and printing said image on said substrate, said at least two flexography stations printing the same liquid coating image in sequence and in superimposed relationship; and

at least one offset lithographic printing station for receiving said substrate and printing over said liquid coating image.

13. Apparatus as in claim 12 wherein said liquid coating image printed on said substrate is a white color ink.

14. Apparatus as in claim 12 further including an air dryer associated with each of said impression cylinders on said flexography stations, said air dryer having sufficient air velocity for drying said liquid coating before the substrate is transferred to the successive printing station in said continuous in-line process.

15. Apparatus for a combined lithographic/flexographic printing process comprising:

a plurality of successive printing stations for printing color images on a substrate in a continuous in-line process, said printing stations including both lithographic and flexographic printing stations;

a blanket cylinder at at least a first one of said flexographic printing stations;

flexographic ink-providing means at said at least first one of said flexographic printing stations for applying a flexographic ink to said blanket cylinder to form an image;

a substrate for receiving said flexographic ink image transferred from said blanket cylinder; and

at least one subsequent lithographic printing station in said in-line process for receiving said image printed substrate and printing an additional colored ink image on said substrate on top of said flexographic ink image using offset lithography.

16. Apparatus as in claim 15 further comprising:

a plate cylinder at said at least first one of said flexographic stations;

a flexographic plate on said plate cylinder for receiving and transferring said flexographic ink to said blanket cylinder; and

said flexographic ink-providing means including a flexographic ink supply and an anilox roller associated with said flexographic ink supply for transferring said flexographic ink to said flexographic plate.

17. Apparatus for a combined lithographic/ flexographic printing process for printing a multicolored image comprising:

a plurality of successive printing stations for printing color on a substrate in a continuous in-line process, said printing stations including both lithographic and flexographic printing stations;

at least one of said flexographic printing stations having:

(1) a plate cylinder and a blanket cylinder, said plate cylinder including a flexographic plate having an

image thereon for transferring a flexographic color ink image to said blanket cylinder;

(2) an etched anilox roller for applying a flexographic color ink to said flexographic plate on said plate cylinder;

(3) an impression cylinder in ink-transfer relationship with said blanket cylinder for transferring said flexographic color ink image from said blanket cylinder to said substrate; and

at least one of said succeeding printing stations being a lithographic printing station using offset lithography for printing additional colored ink images on top of said flexographic ink image.

18. Apparatus as in claim 17 wherein said additional colored ink images are formed with lithographic inks.

19. Apparatus as in claim 17 wherein said colored ink images are formed with waterless inks.

20. Apparatus as in claim 17 further including an air dryer adjacent to said impression cylinder for drying the flexographic ink image transferred to said substrate before said additional colored ink images are printed thereon.

21. Apparatus as in claim 17 further including halftone printing plates for printing said colored ink images.

22. Apparatus as in claim 17 wherein said flexographic ink image and said colored ink images are printed as solid colors and/or with halftone printing plates in sequence and in registry in said successive printing stations to produce said multicolored image on said substrate.

23. Apparatus as in claim 17 wherein said printing apparatus includes a sheet-fed press.

24. Apparatus as in claim 17 wherein at least one of said flexographic printing stations prints said flexographic ink image with liquid vehicle slurry containing an encapsulated essence.

25. Apparatus as in claim 17 wherein at least one of said printing stations prints said flexographic ink image with a water-based liquid vehicle containing suspended particles.

26. Apparatus as in claim 25 wherein said suspended particles are uniform in size.

27. Apparatus as in claim 25 wherein said suspended particles are nonuniform in size.

28. Apparatus as in claim 25 wherein said suspended particles are metallic particles.

29. A method of combining lithography and flexographic printing in a continuous in-line process comprising the steps of:

providing a plurality of successive lithographic/flexographic printing stations for printing colored ink images on a substrate;

printing a flexographic ink image on said substrate at at least one of said flexographic stations;

transferring said printed substrate to at least one subsequent printing station in said continuous in-line process; and

printing colored ink images [on top of] <u>over</u> said flexographic ink image at at least one of said subsequent lithographic printing stations with an offset lithographic process.

30. A method as in claim 29 further comprising the step of drying said flexographic ink image on said substrate with an air dryer prior to printing said colored ink images thereon.

31. A method as in claim 29 further including the step of printing a coating on top of said colored ink images at one of said plurality of subsequent printing stations.

32. A method as in claim 29 wherein said colored inks forming said colored ink images are waterless.

33. A method as in claim 29 wherein said colored inks forming said colored ink images are in a solvent-based liquid vehicle.

34. A method as in claim 29 further including the steps of:

printing a slurry on said substrate at any of said printing stations in said continuous in-line process;

using an encapsulated essence in said slurry; and

printing an overcoating [over] <u>on top of</u> said slurry at a subsequent printing station in said in-line process to protect said essence.

35. A method as in claim 34 further including the step of printing an aqueous-based coating over said slurry.

36. A method as in claim 34 further including the step of printing an ultraviolet coating over said slurry.

37. A method of combining offset lithography and flexographic printing in a continuous in-line process comprising the steps of:

providing a substrate;

applying a flexographic ink to a blanket cylinder in a pattern with a coating head at a first flexographic printing station;

transferring said pattern of flexographic ink from said blanket cylinder to the substrate; and

printing a waterless ink pattern over said flexographic ink pattern on said substrate at at least one subsequent offset lithographic printing station in said continuous in-line process.

38. A method of combining lithography and flexographic printing in a continuous in-line process comprising the steps of:

printing an aqueous-based vehicle image having suspended particles therein on a substrate at a first flexographic printing station;

transferring said image printed substrate to at least one additional printing station in said continuous in-line process; and

printing additional colored ink images on said printed substrate over said aqueous-based vehicle image in an offset lithographic process at said at least one additional printing station in said in-line process.

39. A method of combining lithography and flexographic printing in a continuous in-line process comprising the steps of:

(1) providing a plurality of successive printing stations for printing liquid vehicle images on a substrate in said in-line continuous process;

(2) utilizing an anilox roller to transfer a liquid ink as said liquid vehicle to a flexographic plate image at at least one of said printing stations;

(3) printing said liquid ink from said flexographic plate image to a substrate;

(4) transferring said printed substrate with said liquid ink image to a subsequent printing station in said in-line printing process;

(5) repeating steps (2)-(4) at subsequent printing stations in said in-line process to achieve a desired opacity ink image on said substrate; and

(6) printing an ink pattern over said flexographic ink image using an offset lithographic process.

40. A method as in claim 39 further including the step of additionally printing colored ink images over said liquid ink image on said substrate at subsequent ones of said printing stations in said in-line process.

41. A method as in claim 40 wherein said liquid ink is an opaque white color.

42. The apparatus of any of claims 1, 6, 10, 12, 15 and 17, wherein the substrate is printed on both sides in one pass during the continuous in-line process.

43. The method of any of claims 29, 37, 38 or 39 wherein the substrate is printed on both sides in one pass during the continuous in-line process.

44. Apparatus for a combined lithographic/flexographic printing process comprising:

a substrate;

a plurality of successive printing stations for depositing a series of thin, controlled layers on one side of a substrate in a continuous in-line process;

one of said stations comprising a flexographic printing station for printing a liquid vehicle image on said substrate using a flexographic process; and

at least one of said successive printing stations being a lithographic printing station;

whereby said substrate is printed on top of or on the opposite side of that previously printed at at least one of said successive lithographic printing stations using the lithographic process in said continuous in-line process.

45. Apparatus as in claim 44 wherein at least one of said thin, controlled layers at the flexographic station is a coating material.

46. Apparatus as in claim 44 wherein at least one of said thin, controlled layers at one of the lithographic stations is an ink.

47. Apparatus as in claim 44 wherein:

said substrate is a paper sheet; and

said apparatus includes a sheet feeder.

48. Apparatus as in claim 44 wherein:

said substrate is a web; and

said apparatus includes a web feeder.

49. The apparatus of claim 44 for a combined lithographic/flexographic printing process comprising:

a plurality of successive printing stations for depositing a series of thin, controlled layers on a substrate in a continuous in-line process;

one of said stations comprising a flexographic printing station printing an aqueous-based vehicle on one side of the substrate using the flexographic process to form a metallic coating image;

a suspended metallic material being included in said aqueous-based vehicle; and

at least one of the successive printing stations comprising an offset lithographic printing station printing a color image on top of the aqueous-based vehicle or on the opposite side to that previously printed using the offset lithographic process in said continuous in-line process.

50. Apparatus as in claim 49 wherein said suspended material includes uniform-sized metal particles to form said metallic coating.

51. Apparatus as in claim 49 wherein said suspended material includes nonuniform-sized metal particles to form said metallic coating.

52. Apparatus as in claim 49 further including: said flexographic printing station including a plate cylinder having a flexographic plate thereon, a blanket cylinder, and an impression cylinder;

a flexographic plate image transferred from said plate cylinder to said blanket cylinder, said image being formed of said metallic coating, said blanket cylinder transferring said metallic coating to said impression cylinder for printing said flexographic plate image on said substrate; and

an anilox roller associated with said flexographic plate for supplying said aqueous-based vehicle containing said suspended metallic material to said flexographic plate.

53. Apparatus for creating a combined lithographic/flexographic printing process comprising:

a plurality of successive printing stations for depositing a series of thin, controlled layers on a substrate in a continuous in-line process;

one of said stations comprising a flexographic printing station for printing a first color image using the flexographic process; and

at least one of the other successive printing stations comprising an offset lithographic printing station for printing a second color image on the reverse side of the substrate of the first color image using the offset lithographic process in said continuous in-line process.

54. Apparatus as in claim 53 further including:

said flexographic printing station including a plate cylinder, a blanket cylinder, and an impression cylinder;

a flexographic plate on said plate cylinder;

an anilox roller associated with said flexographic plate for supplying a first color to said flexographic plate to form said first color image; and

said blanket cylinder receiving said first color image from said plate cylinder and transferring said first color image to said impression cylinder for printing on said substrate.

55. Apparatus for creating a combined lithographic/flexographic printing process comprising:

a substrate;

a plurality of successive printing stations for depositing a series of thin, controlled layers on a substrate in a continuous in-line process;

at least one of said printing stations being flexographic stations and comprising:

(1) a supply of liquid coating;

(2) a plate cylinder associated with a blanket cylinder, said plate cylinder having a flexographic plate thereon;

(3) an anilox roller associated with said liquid supply coating and said plate cylinder for delivering said liquid coating to said flexographic plate to form an image for transfer to said blanket cylinder;

(4) an impression cylinder for receiving said liquid coating image transferred from said blanket cylinder and printing said image on one side of said substrate; and

at least one offset lithographic printing station for receiving said substrate and printing on top of or on the opposite side to that previously printed.

56. Apparatus as in claim 55 wherein said liquid coating image printed on said substrate is a white color ink.

57. Apparatus as in claim 56 further including an air dryer associated with each of said impression cylinders on said flexography stations, said air dryer having sufficient air velocity for drying said liquid coating before the substrate is transferred to the successive printing station in said continuous in-line process.

58. Apparatus for a combined lithographic/ flexographic printing process comprising:

a plurality of successive printing stations for depositing a series of thin, controlled layers on a substrate in a continuous in-line process, said printing stations including both lithographic and at least two flexographic printing stations;

a blanket cylinder at at least a first one of said flexographic printing stations;

flexographic ink-providing means at the other of said flexographic printing stations for applying a flexographic ink to said blanket cylinder to form an image on one side of a substrate;

a substrate for receiving said flexographic ink image transferred from said blanket cylinder; and

at least one subsequent lithographic printing station in said in-line process for receiving said image printed substrate and printing an additional colored ink image on said substrate on top of said flexographic ink image or the opposite side to that previously printed using offset lithography.

59. Apparatus as in claim 58 further comprising:

a plate cylinder at said at least first one of said flexographic stations;

a flexographic plate on said plate cylinder for receiving and transferring said flexographic ink to said blanket cylinder; and

said flexographic ink-providing means including a flexographic ink supply and an anilox roller associated with said flexographic ink supply for transferring said flexographic ink to said flexographic plate.

60. Apparatus for a combined lithographic/ flexographic printing process for printing a multicolored image comprising:

a plurality of successive printing stations for depositing a series of thin, controlled layers on a substrate in a continuous in-line process, said printing stations including both lithographic and flexographic printing stations;

at least one of said flexographic printing stations having:

(1) a plate cylinder and a blanket cylinder, said plate cylinder including a flexographic plate having an image thereon for transferring a flexographic color ink image to said blanket cylinder;

(2) an etched anilox roller for applying a flexographic color ink to said flexographic plate on said plate cylinder;

(3) an impression cylinder in ink-transfer relationship with said blanket cylinder for transferring said flexographic color ink image from said blanket cylinder to one side of said substrate; and

at least one of said succeeding printing stations being a lithographic printing station using offset lithography for printing additional colored ink images on top of said flexographic ink image or on the opposite side to that that previously printed.

61. Apparatus as in claim 60 wherein said additional colored ink images are formed with lithographic inks.

62. Apparatus as in claim 60 wherein said colored ink images are formed with waterless inks.

63. Apparatus as in claim 60 further including an air dryer adjacent to said impression cylinder for drying the flexographic ink image transferred to said substrate before said additional colored ink images are printed thereon.

64. Apparatus as in claim 60 further including halftone printing plates for printing said colored ink images.

65. Apparatus as in claim 60 wherein said flexographic ink image and said colored ink images are printed as solid colors and/or with halftone printing plates in sequence and in registry in said successive printing stations to produce said multicolored image on said substrate.

66. Apparatus as in claim 60 wherein said printing apparatus includes a sheet-fed press.

67. Apparatus as in claim 60 wherein at least one of said flexographic printing stations prints said flexographic ink image with liquid vehicle slurry containing an encapsulated essence.

68. Apparatus as in claim 60 wherein at least one of said printing stations prints said flexographic ink image with a water-based liquid vehicle containing suspended particles.

69. Apparatus as in claim 68 wherein said suspended particles are uniform in size.

70. Apparatus as in claim 68 wherein said suspended particles are nonuniform in size.

71. Apparatus as in claim 68 wherein said suspended particles are metallic particles.

72. A method of combining lithography and flexographic printing in a continuous in-line process comprising the steps of:

providing a plurality of successive lithographic/ flexographic printing stations for depositing a series of thin, controlled layers on a substrate;

printing an image as one of said thin controlled layers on one side of said substrate at at least one of said flexographic stations;

transferring said printed substrate to at least one subsequent printing station in said continuous in-line process; and

printing an image on the reverse side of said substrate having said flexographic ink image, at at least one of said other subsequent lithographic printing stations with an offset lithographic process in the continuous in-line process.

73. A method as in claim 72 further comprising the step of drying said flexographic ink image on said substrate with an air dryer prior to printing said colored ink images thereon.

74. A method as in claim 72 further including the step of printing a coating on top of said colored ink images at one of said plurality of subsequent printing stations.

75. A method as in claim 72 wherein said colored inks forming said colored ink images are waterless.

76. A method as in claim 72 wherein said colored inks forming said colored ink images are in a solvent-based liquid vehicle.

77. A method as in claim 72 further including the steps of:

printing a slurry on one side of said substrate at any of said printing stations in said continuous in-line process;

using an encapsulated essence in said slurry; and

printing an ink on the reverse side of said substrate at a subsequent printing station in said in-line process.

78. A method as in claim 77urther including the step of printing an aqueous-based coating over said slurry.

79. A method as in claim 77 further including the step of printing an ultraviolet coating over said slurry.

80. A method of combining offset lithography and flexographic printing in a continuous in-line process comprising the steps of:

providing a substrate;

applying an ink or coating to a blanket cylinder in a pattern with a coating head at a flexographic printing station;

transferring said pattern of ink or coating from said blanket cylinder to one side of the substrate; and

printing a waterless ink pattern on the reverse side of said substrate at at least one subsequent offset lithographic printing station in said continuous in-line process.

81. A method of combining lithography and flexographic printing in a continuous in-line process comprising the steps of:

printing an aqueous-based vehicle having suspended particles therein on one side of a substrate at a flexographic printing station to form an image;

transferring said image printed substrate to at least one additional printing station in said continuous in-line process; and

printing additional images on the reverse side of said printed substrate in an offset lithographic process at said at least one additional printing station in said in-line process.

82. A method of combining lithography and flexographic printing in a continuous in-line process comprising the steps of:

(1) providing a plurality of successive printing stations for depositing a series of thin, controlled layers on a substrate in said in-line continuous process;

(2) utilizing an anilox roller to transfer a liquid ink as one of said thin controlled layers to a flexographic plate image at at least one of said printing stations;

(3) printing said liquid ink from said flexographic plate image to one side of a substrate;

(4) transferring said printed substrate with said liquid ink image to a subsequent printing station in said in-line printing process;

(5) repeating steps (2)-(4) at subsequent printing stations in said in-line process to achieve a desired opacity ink image on the one side of said substrate; and

(6) printing an ink pattern on the reverse side of said substrate using an offset lithographic process.

83. A method as in claim 82 further including the step of additionally printing ink images over said liquid ink image on said substrate at subsequent ones of said printing stations in said in-line process.

84. A method as in claim 83 wherein said liquid ink is an opaque white color.

85. A method of combining offset lithography and flexography using a plurality of successive printing stations in a continuous in-line process comprising:

(1) printing an image at one or more of said printing stations on a substrate using an offset lithographic process;

(2) transferring said image printed substrate to an additional printing station and printing at said additional printing station a coating on all or part of said image on said substrate;

(3) transferring said substrate to one or more additional printing stations for printing the reverse side of the said substrate; and

(4) printing an image on said reverse side of said substrate at one of such one or more printing stations using an offset lithographic process in the continuous in-line process.

86. Apparatus for a combined offset lithographic and flexographic printing process comprising:

(1) a substrate;

(2) a plurality of successive printing stations for depositing a series of thin layers of materials selected from a group consisting of lithographic and flexographic inks, coatings and slurries on one or both sides of a substrate in a continuous in-line process;

(3) at least one of said stations comprising a flexographic printing station for printing one of said flexographic materials on said substrate using a flexographic process;

(4) at least one of said successive printing stations being an offset lithographic printing station whereby said offset lithographic printing station is used to deposit one of said lithographic materials on either side of the said substrate in the continuous in-line process;

87. Apparatus for a combined offset lithographic/flexographic printing process comprising:

a plurality of successive printing stations for printing images on a substrate in a continuous in-line process, said printing stations including both offset lithographic and flexographic printing stations for depositing lithographic and flexographic inks, coatings and slurries on said substrate, whereby said lithographic and flexographic inks, coatings or slurries may be printed successively on one or both sides of said substrate in the continuous in-line process.

Supplemental Prince Exhibit C

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form

the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless --
>
> (e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1 - 6, 9 - 20, 22 - 25, and 28 - 38 are rejected under 35 U.S.C. 102(e) as being anticipated by DeMoore et al. (US 5,960,713). DeMoore et al. is ultimately a CIP of S.N. 08/435,798 which has a filing date of 5/4/95. While this patent is a CIP of the earlier application, and could contain subject matter not disclosed in that application, reference can presently be made to EP 741,025 which claims direct priority from S.N. 08/435,798. All references to Demoore et al. will be made to EP 741,025.

DeMoore et al. teach a first flexographic station (22, 110) for printing either colored inks, white ink, metallic particles, an encapsulated essence, or aqueous or UV coatings on a sheet or web (col. 2 lines 40-45, col. 3 lines 17-21, col. 4 lines 32-35, col. 9 line 47 - col. 10 line 18) and at least one successive lithographic station (24-28) for printing colored inks, aqueous, or UV coatings (col. 4 lines 32-50 and col. 10 lines 19-27). Applicant should carefully

review the entire document of DeMoore et al. With respect to the flexographic plate, plate cylinder, blanket cylinder, and anilox roller see column 10 lines 4 - 11. With respect to successive flexographic stations see column 6 lines 21 - 27. With respect to the air dryer see column 9 lines 1 - 10. With respect to the waterless inks see column 3 lines 21 - 30 and column 10 lines 19 - 27. With respect to claim 22 the plates would inherently be either solid or halftone.

Claims 7, 8, 21, 26, 27, and 39 - 87 are rejected under 35 U.S.C. 103(a) as being unpatentable over DeMoore et al. With respect to the size of the metallic particles it would have been obvious to one of ordinary skill in the art to use uniform sized particles to achieve a uniform, flat printed image or non-uniform sized particles to achieve a desired textured appearance. With respect to claim 21 it is widely conventional in the art to make halftone lithographic printing plates to achieve superior image appearance. With respect to claim 39 it would have been obvious to one of ordinary skill in the art to overprint the same image with the same color ink to simply achieve a denser or more opaque color. With respect to the added claims, insofar as they are adequately supported by the original disclosure, DeMoore et al. teach in column 3 lines 17 - 19 that the substrate may be printed on either side. It would have been obvious to one of ordinary skill in the art to selectively print on both sides of the substrate so as to achieve desirable perfector printing.

EXHIBIT B

US005960713A

United States Patent [19]

DeMoore et al.

[11] Patent Number: 5,960,713

[45] Date of Patent: Oct. 5, 1999

[54] **RETRACTABLE PRINTING-COATING UNIT OPERABLE ON THE PLATE AND BLANKET CYLINDERS SIMULTANEOUSLY FROM THE DAMPENER SIDE OF THE FIRST PRINTING UNIT OR ANY CONSECUTIVE PRINTING UNIT OR ANY ROTARY OFFSET PRINTING PRESS**

[75] Inventors: **Howard W. DeMoore**, 10954 Shady Trail, Dallas, Tex. 75220; **Ronald M. Rendlemann**, Dallas, Tex.; **John W. Bird**, Carrollton, Tex.

[73] Assignee: **Howard W. DeMoore**, Dallas, Tex.

[21] Appl. No.: **09/136,901**

[22] Filed: **Aug. 19, 1998**

Related U.S. Application Data

[63] Continuation-in-part of application No. 08/538,422, Oct. 2, 1995, abandoned, which is a continuation-in-part of application No. 08/435,798, May 4, 1995.

[51] **Int. Cl.**[6] **B41F 7/06**; B41F 5/02; B41F 5/22

[52] **U.S. Cl.** **101/137**; 101/177

[58] **Field of Search** 101/136, 137, 101/142, 143, 144, 145, 177, 183, 207–210, 216, 217, 218, 349.1, 350.1, 350.2, 351.3, 352.01, 352.02, 352.04, 352.05, 363

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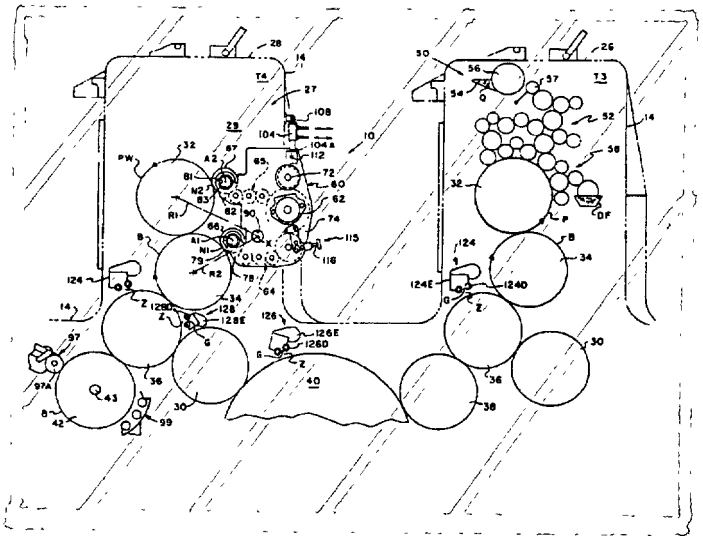
Primary Examiner—J. Reed Fisher
Attorney, Agent, or Firm—Locke Liddell & Sapp LLP

[57] **ABSTRACT**

A retractable in-line inking/coating apparatus can apply either spot or overall inking/coating material to a plate and/or a blanket on the first printing unit or on any consecutive printing unit of any rotary offset printing press. The inking/coating apparatus is pivotally mounted within the conventional dampener space of any lithographic printing unit. The aqueous component of the flexographic printing ink or aqueous coating material is evaporated and dried by high velocity, hot air dryers and high performance heat and moisture extractors so that the aqueous or flexographic ink or coating material on a freshly printed or coated sheet is dry and can be dry-trapped on the next printing unit. The inking/coating apparatus includes dual cradles that support first and second applicator rollers so that the inking/coating apparatus can apply a double bump of aqueous/flexographic or UV-curable printing ink or coating material to a plate on the plate cylinder, while simultaneously applying aqueous, flexograhic or UV-curable printing ink or coating material to a plate or a blanket on the blanket cylinder, and thereafter onto a sheet as the sheet is transferred through the nip between the blanket cylinder and the impression cylinder. A triple bump is printed or coated on the last printing unit with the aid of an impression cylinder inking/coating unit.

26 Claims, 15 Drawing Sheets



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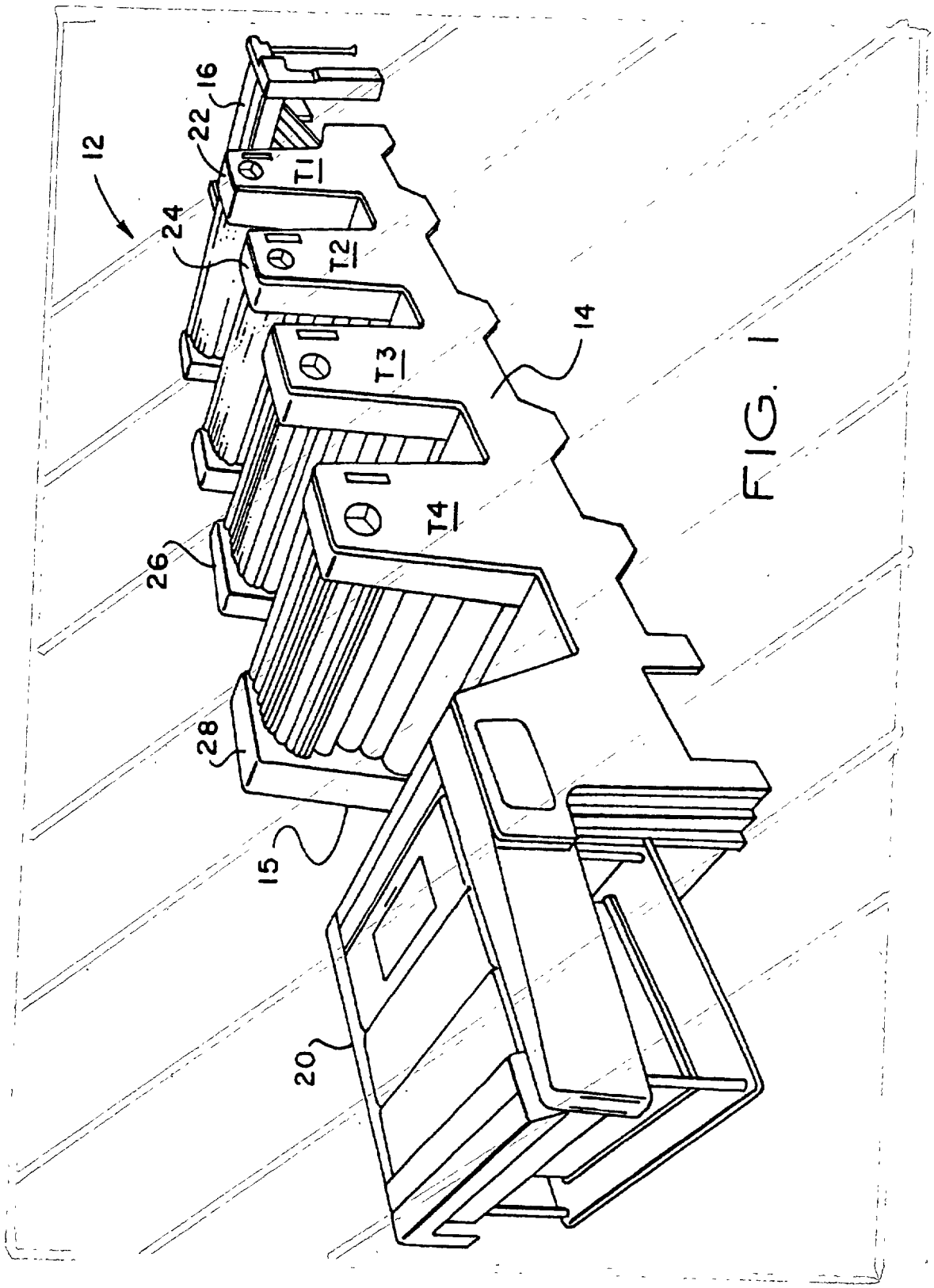
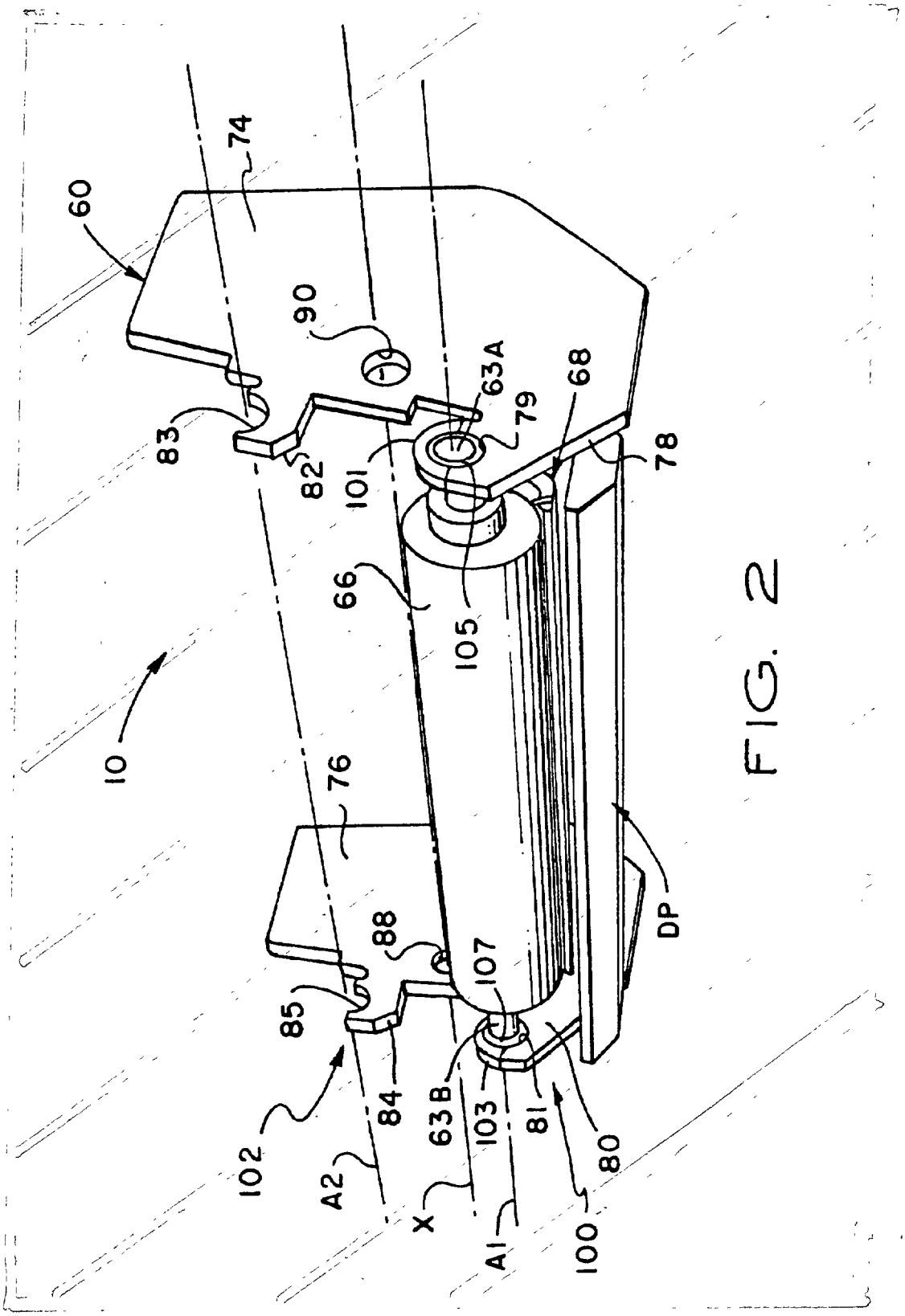


FIG. 1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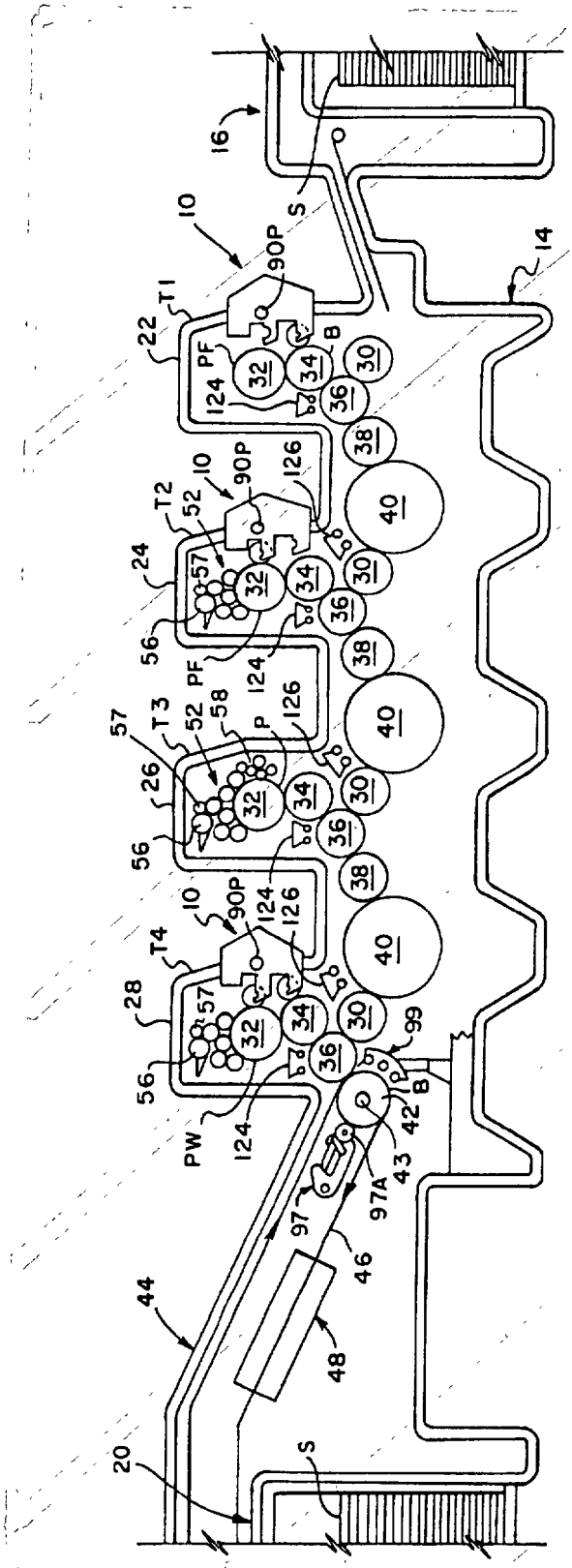
63B
103
81
80
102
A2
X
A1
100

FIG. 2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S
14
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30
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126
T2
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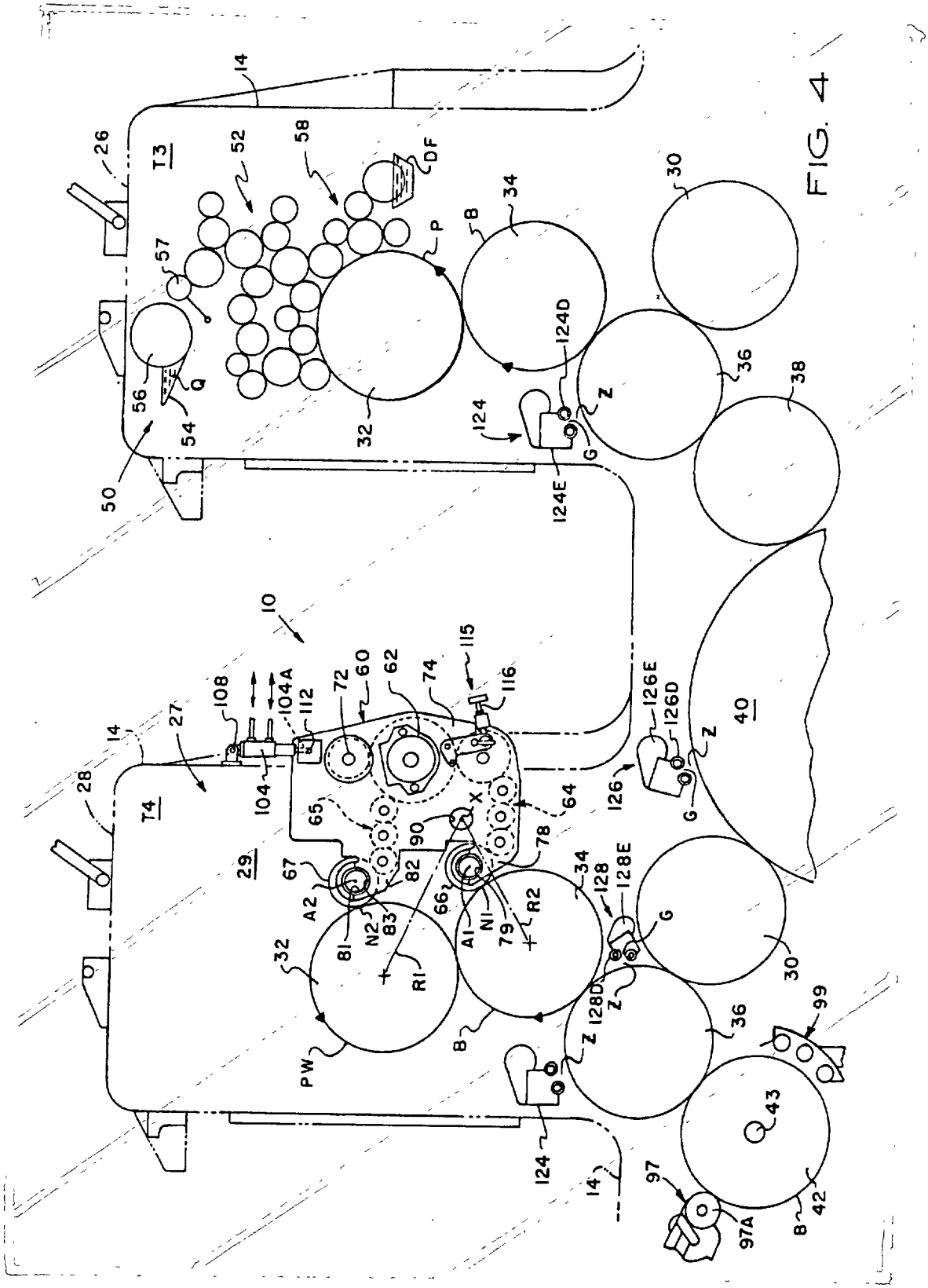
24
57
56
58
P
T3
26
T4
28
99
B
42
43
97A
97
46
44
48
20
PW

FIG. 3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60
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64
65
66
67
72
74
78
79
81
82
83
90
97
97A
99
104
104A
108
112
115
116
124
124D
124E
126
126D
126E
128
128D
128E
A1
A2
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DF
G
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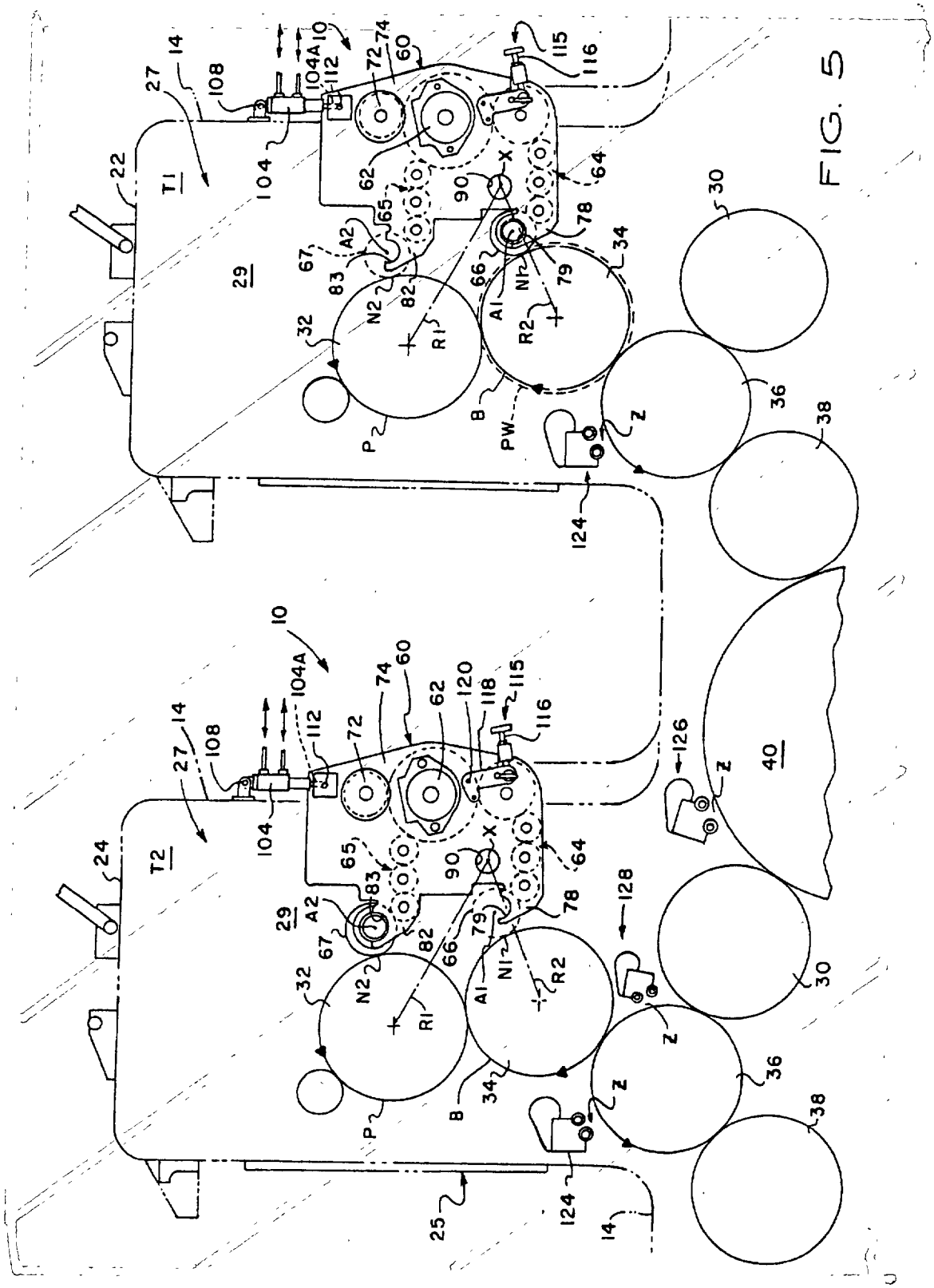
N2
P
PW
Q
R1
R2
X
Z

FIG. 4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T2
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83
90
115
116
118
120
22
24
25
30
32
34
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38
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128
A1
A2
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R1
R2
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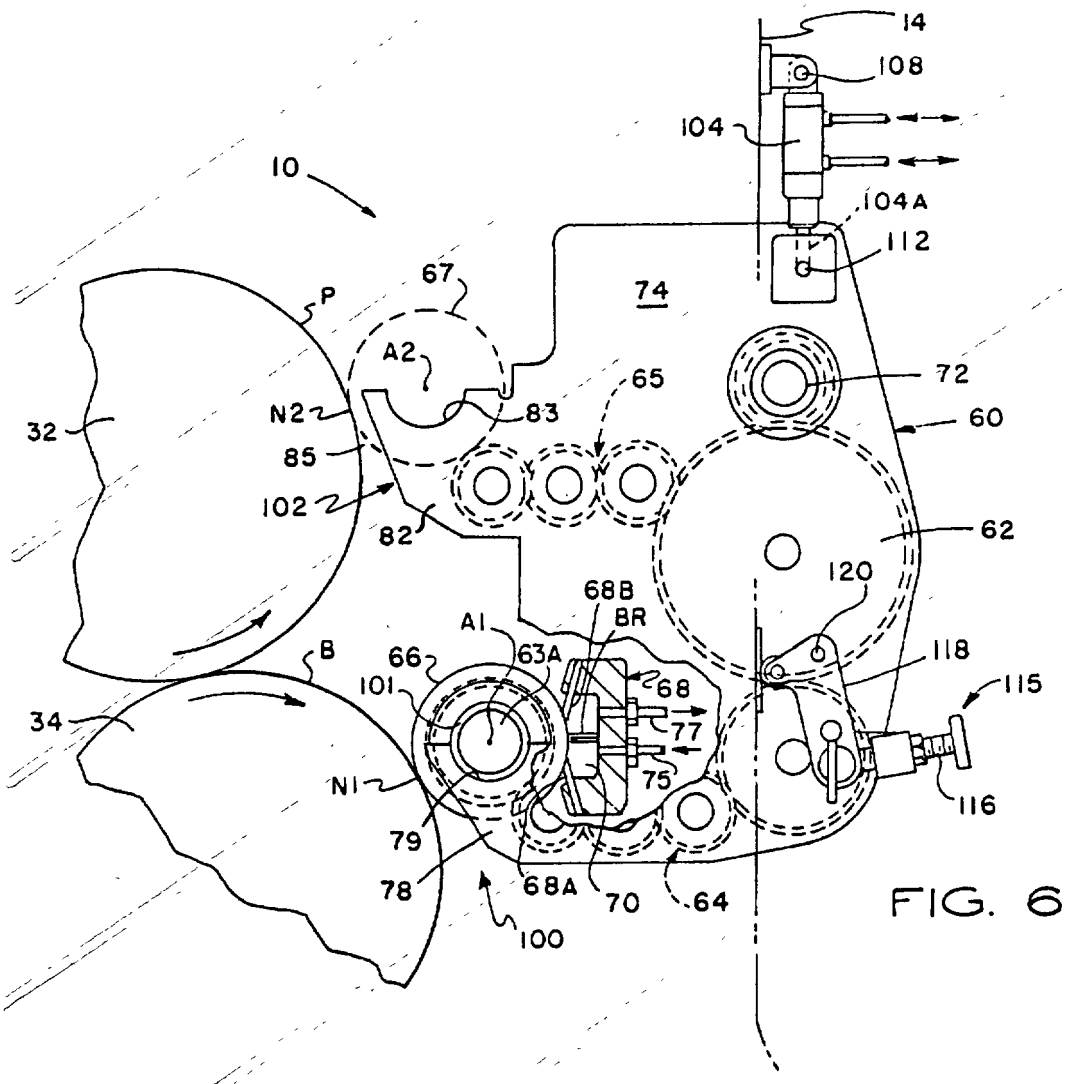
PW
Z
X

FIG. 5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P
A2
72
65
32
N2
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82
62
120
68B
BR
A1
66
63A
B
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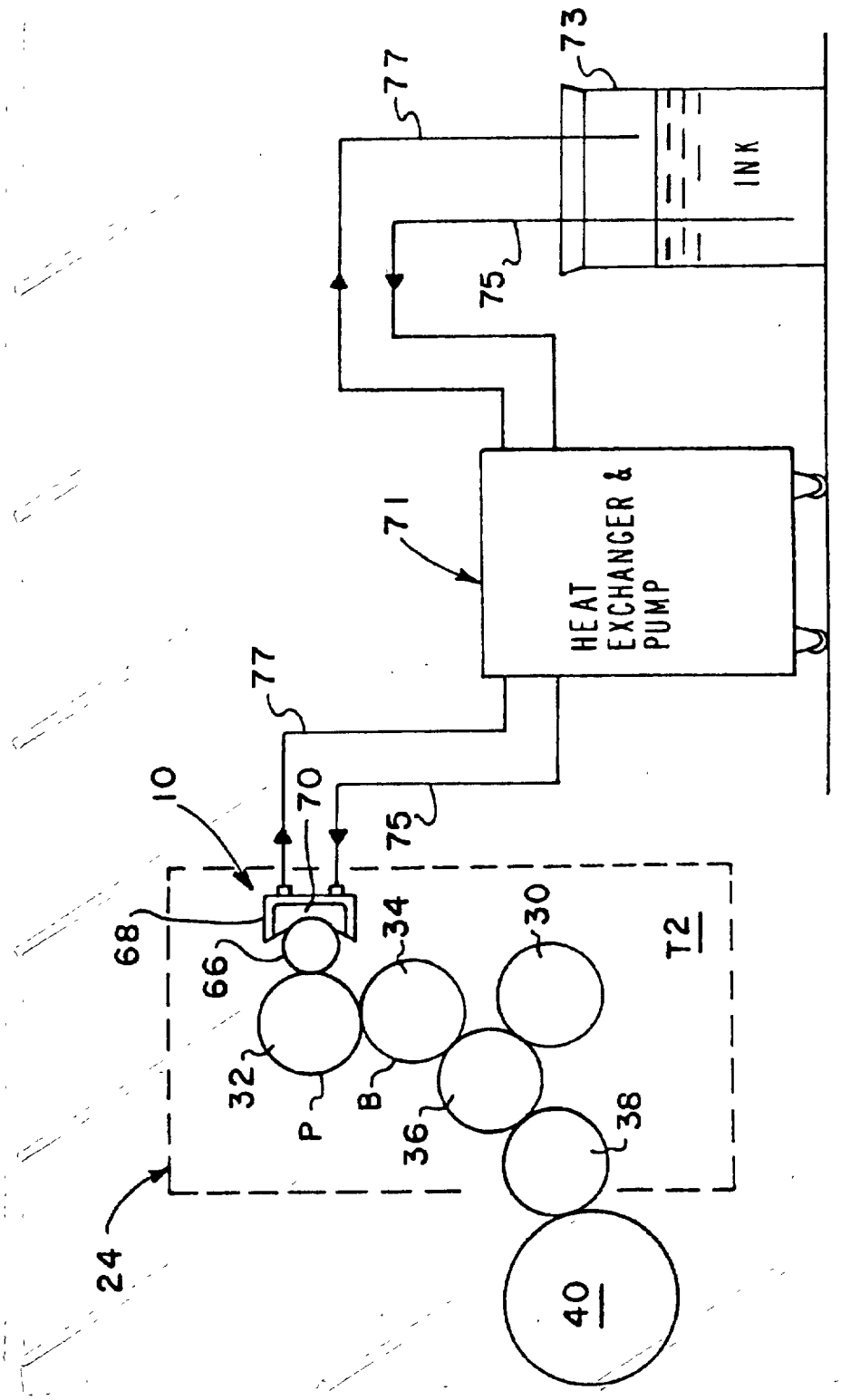
101
68
115
34
77
75
N1
116
79
78
68A
70
64
100

FIG. 6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HEAT EXCHANGER & PUMP
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P
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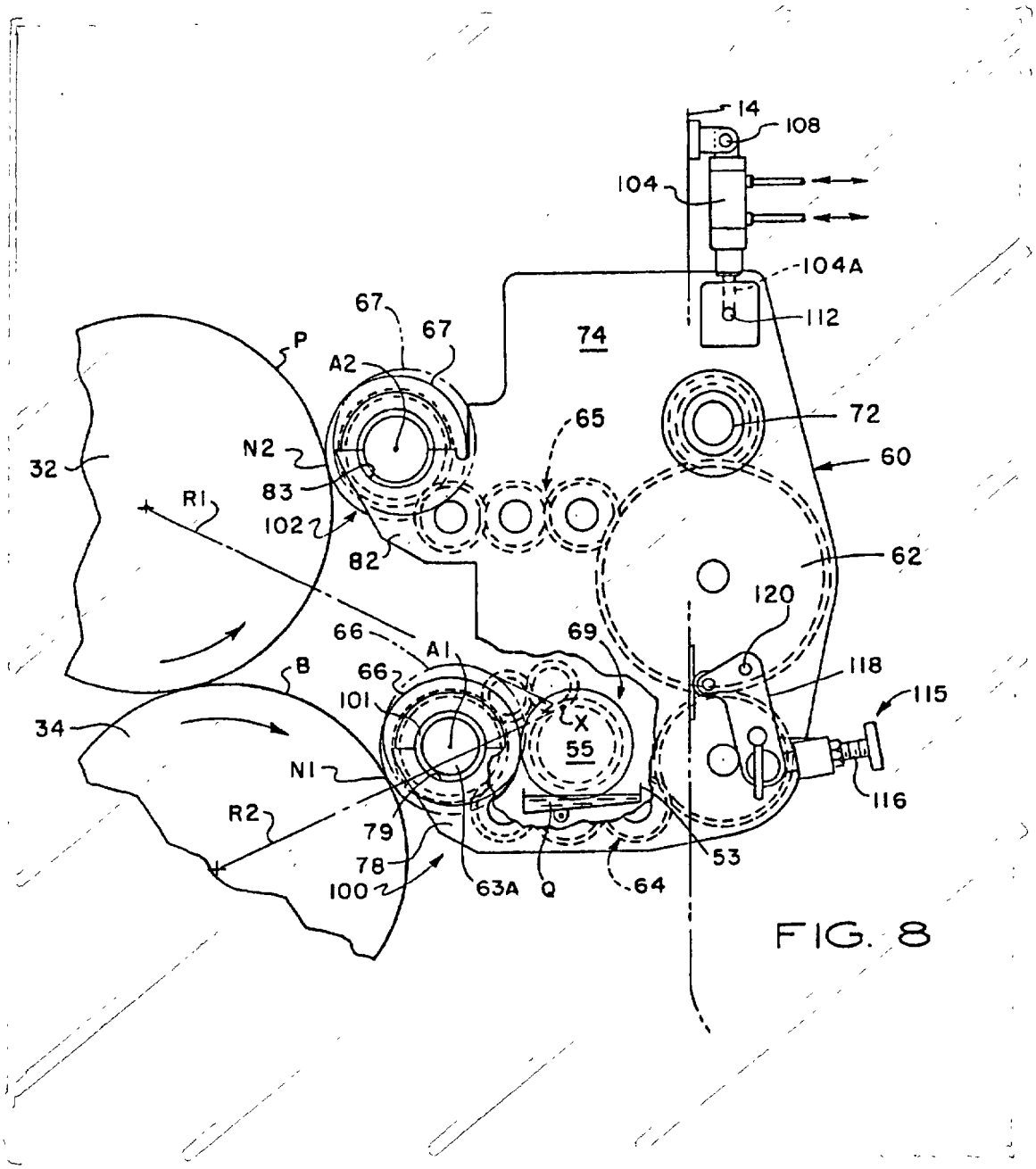
FIG. 7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P
A2
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32
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120
66
A1
69
66
B
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115
101
X
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34
N1
R2
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100
63A
Q
64
53
116

FIG. 8

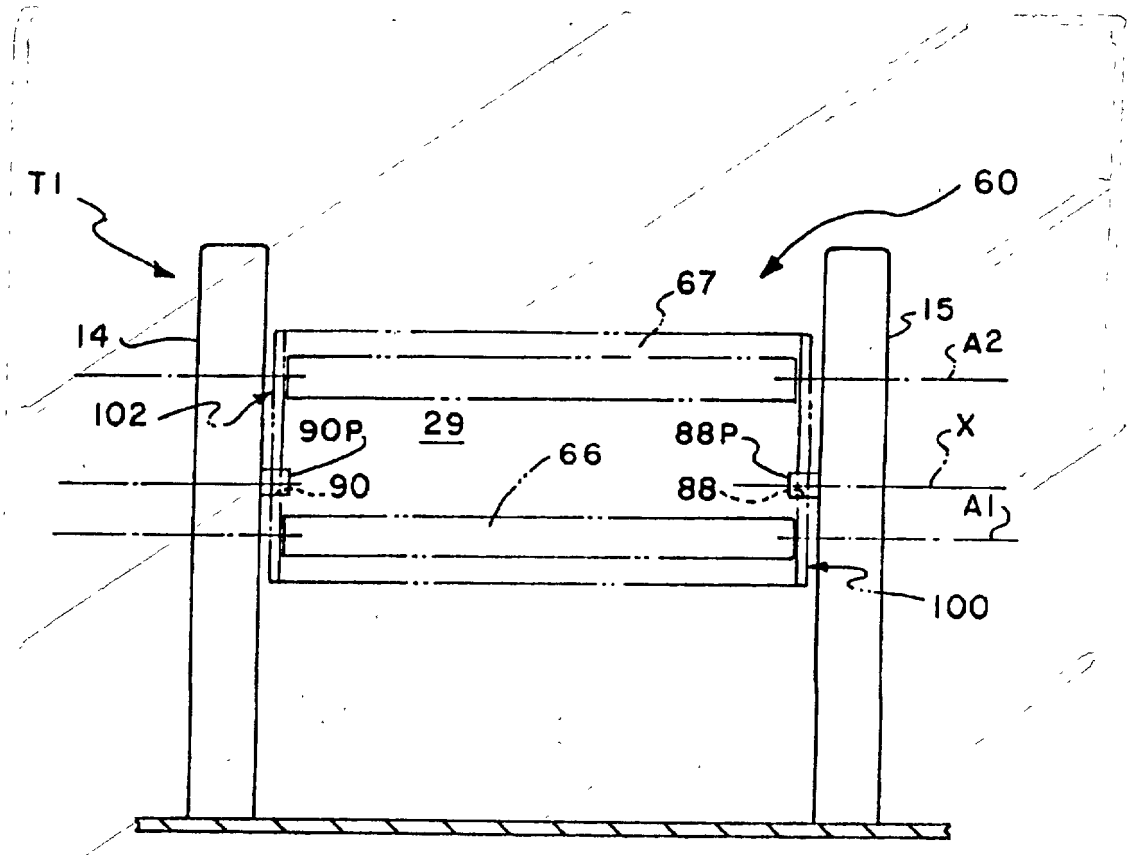
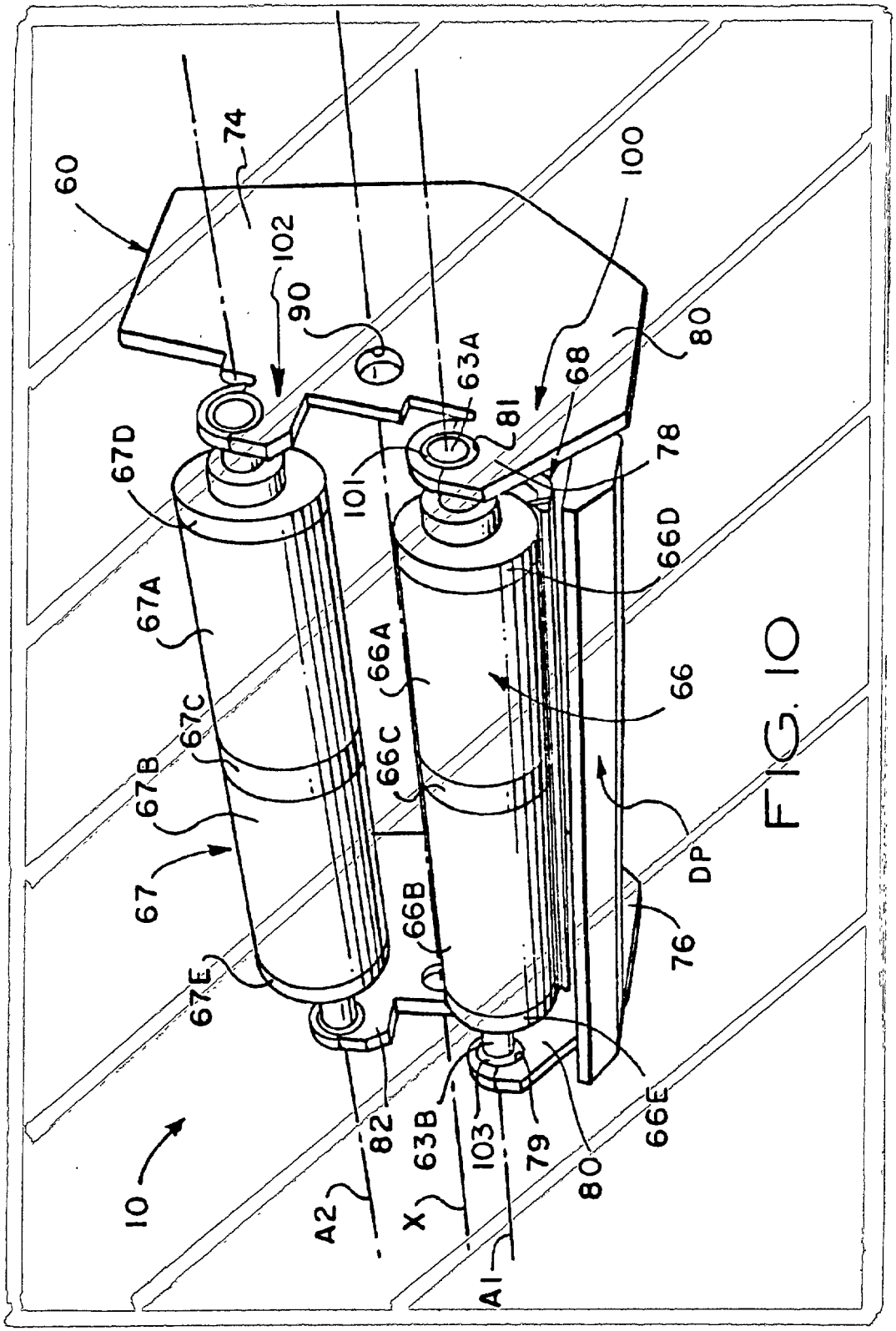


FIG. 9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66A
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67C
66C
67B
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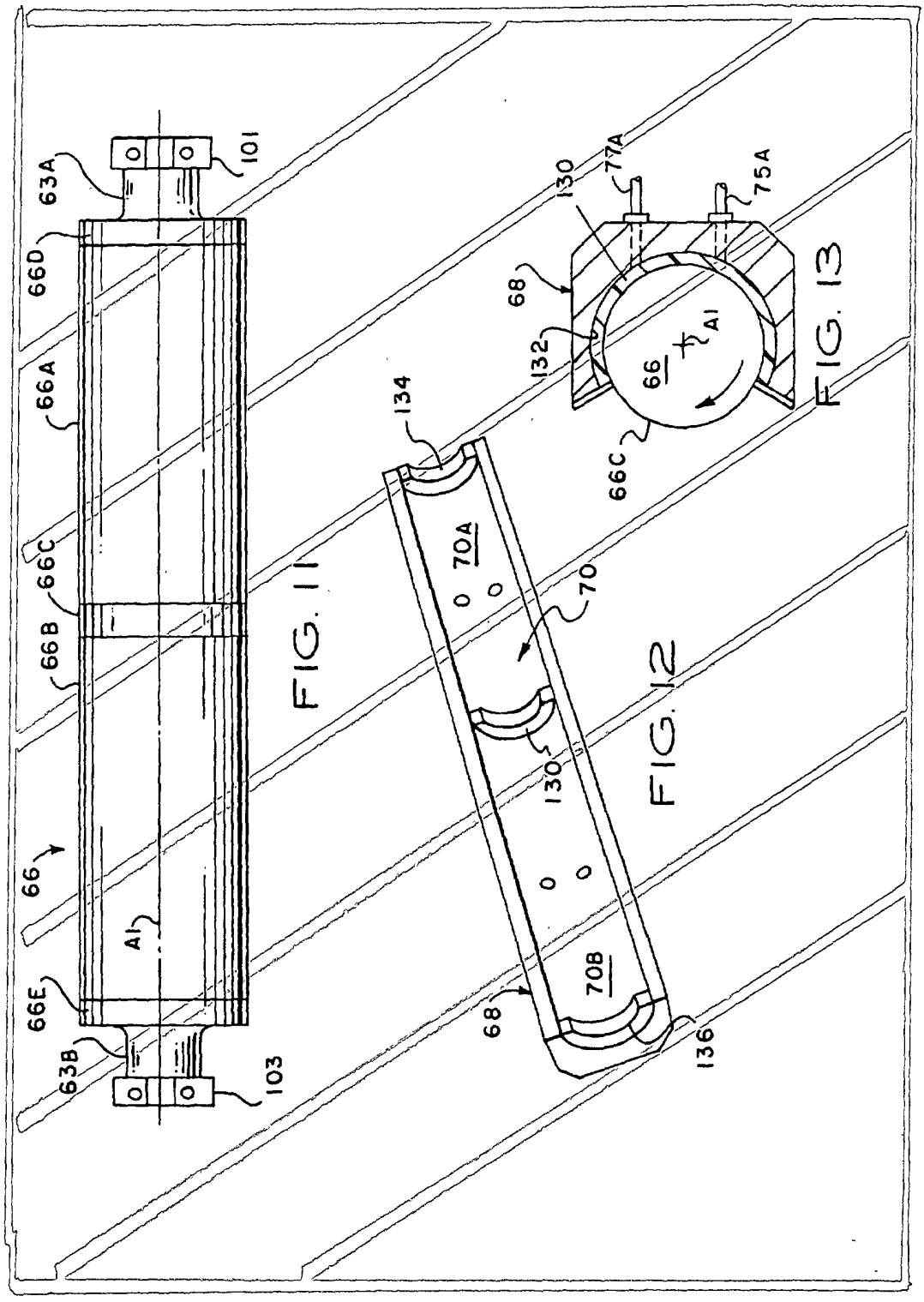
66B
DP
76
67E
66E
82
63B
103
79
80
10
A2
X
A1

FIG. 10


101
63A
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66C
66B
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A1
66E
63B
103
FIG. 11
134
70A
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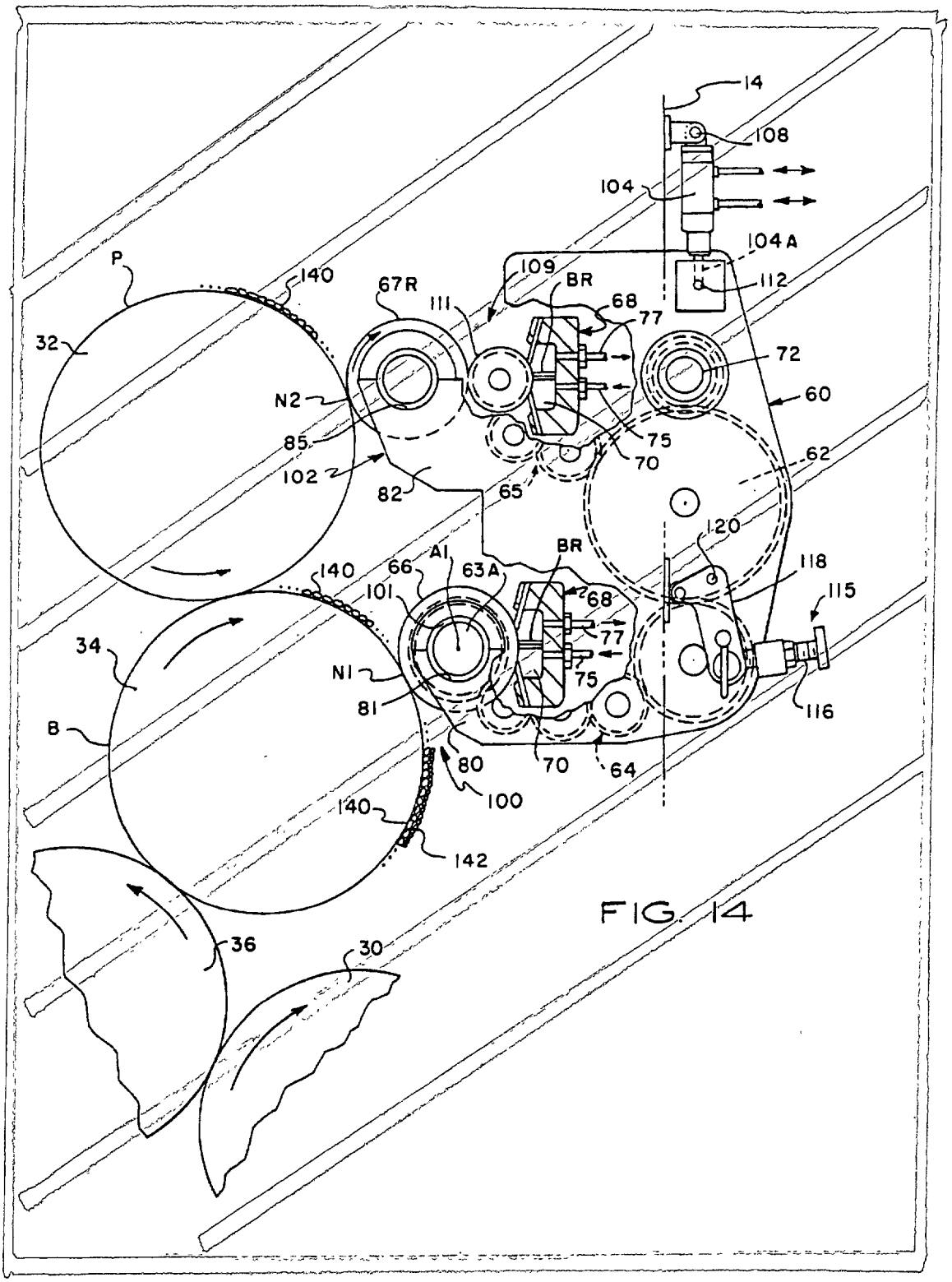
70B
68
136
FIG. 12
130
77A
75A
68
132
66
A1
66C
FIG. 13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75
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62
120
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115
116
BR
68
77
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142
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30

FIG. 14

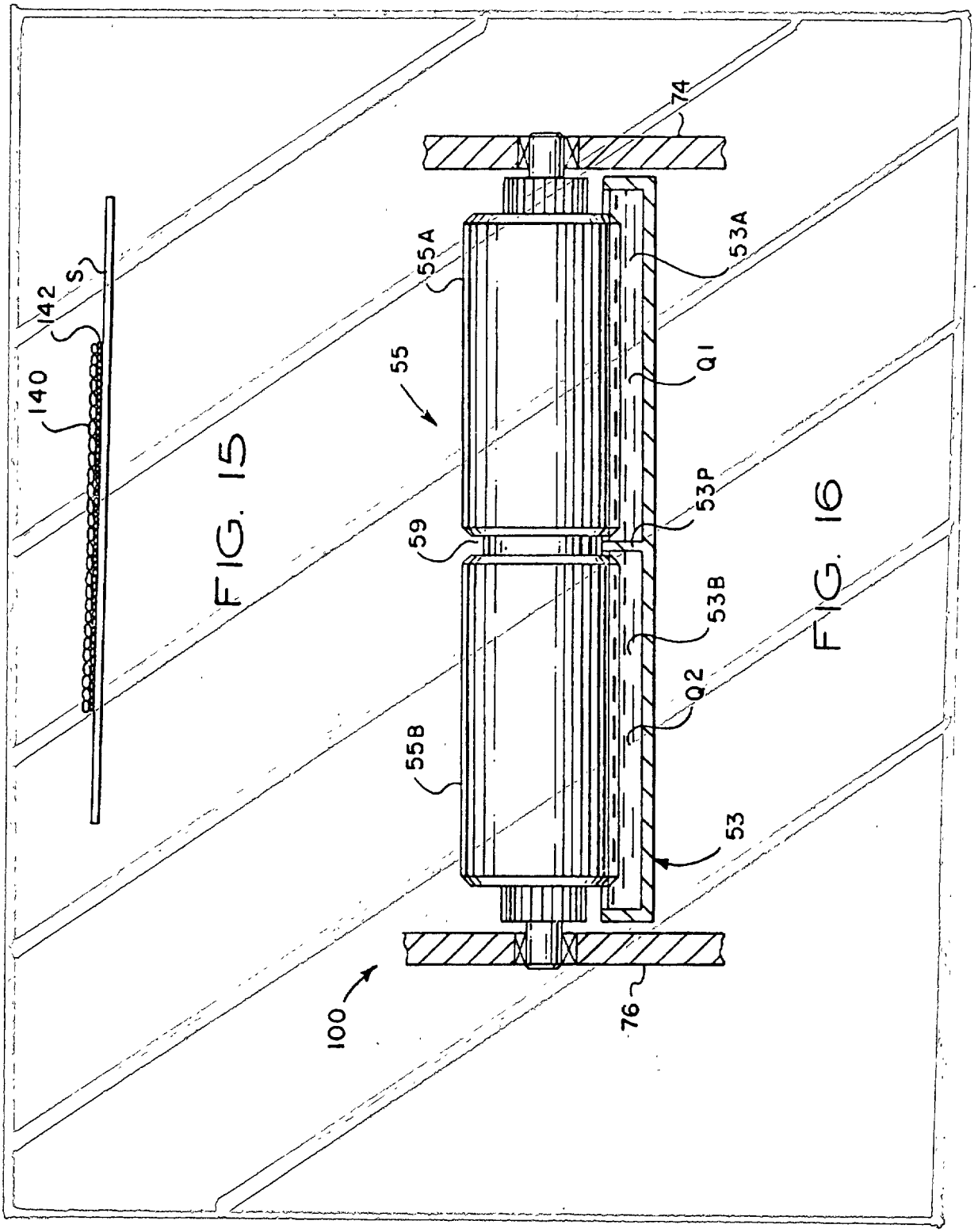
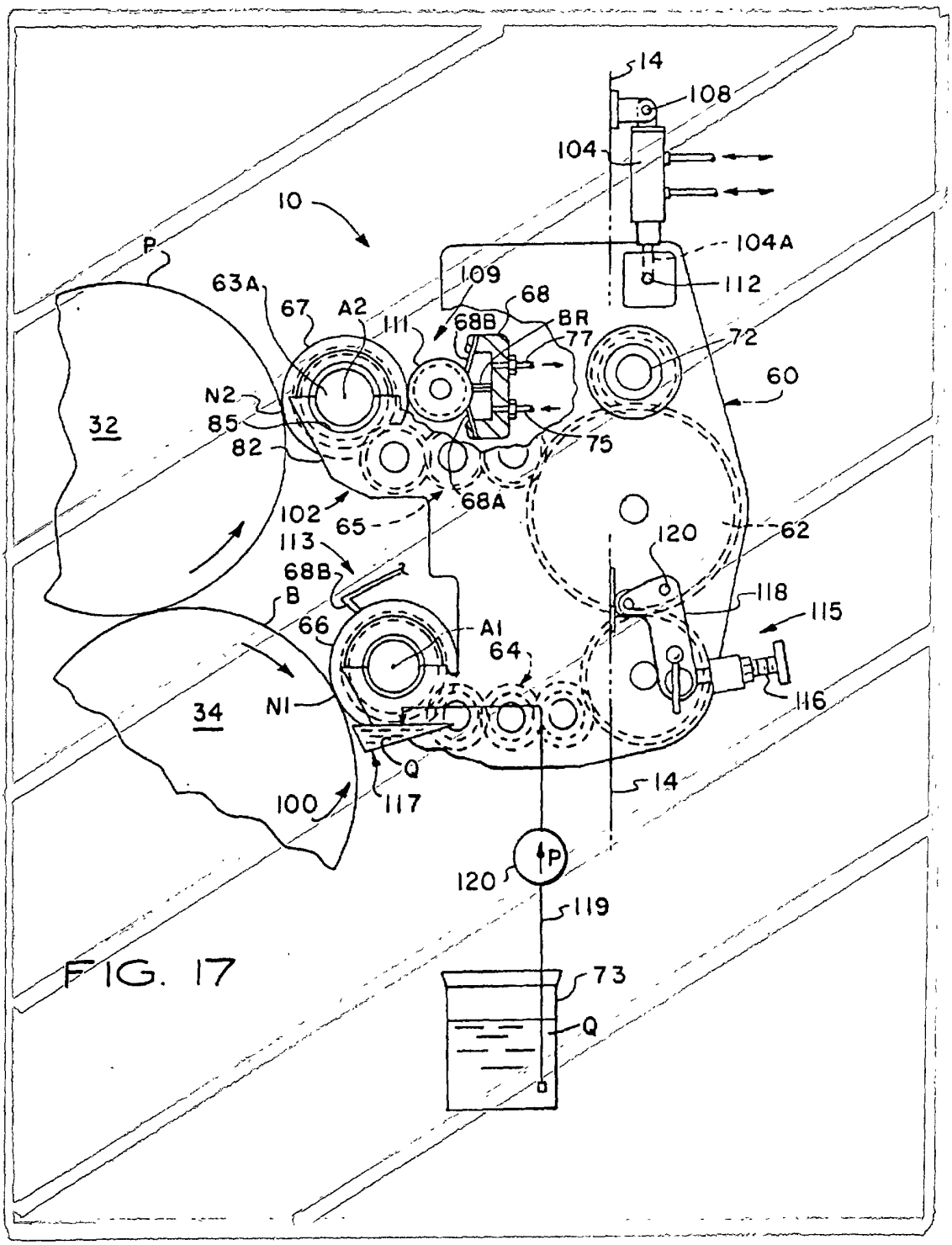


FIG. 15

FIG. 16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108
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A2
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111
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32
75
102
65
68A
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62
113
68B
B
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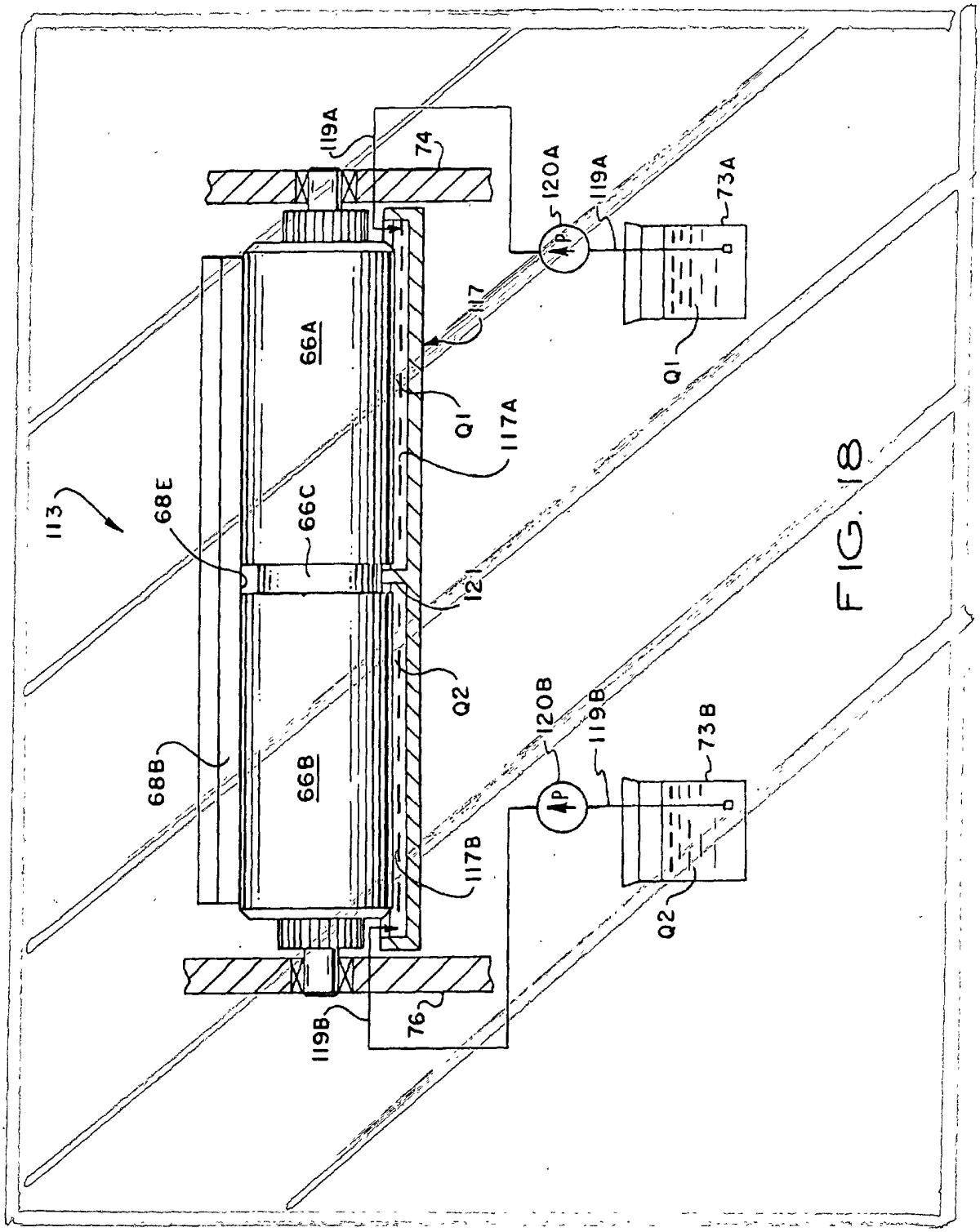
Q

FIG. 17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Q1
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Q2
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119B
73B
68B
66B
117B
Q2
76
119B

FIG. 18

RETRACTABLE PRINTING-COATING UNIT OPERABLE ON THE PLATE AND BLANKET CYLINDERS SIMULTANEOUSLY FROM THE DAMPENER SIDE OF THE FIRST PRINTING UNIT OR ANY CONSECUTIVE PRINTING UNIT OR ANY ROTARY OFFSET PRINTING PRESS

CROSS REFERENCE TO OTHER APPLICATIONS

This application is a continuation-in-part of prior application Ser. No. 08/538,422 filed Oct. 2, 1995, now abandoned by inventors Howard W. DeMoore, Ronald M. Rendleman and John W. Bird which in turn was a continuation-in-part of prior parent application Ser. No. 08/435,798, titled "Retractable Inking/Coating Apparatus Having Ferris Movement Between Printing Units", filed May 4, 1995 by the same inventors for which priority benefit under § 120 is claimed.

FIELD OF THE INVENTION

This invention relates generally to sheet-fed or web-fed, rotary offset lithographic printing presses, and more particularly, to a new and improved inking/coating apparatus for the in-line application of aqueous or flexographic printing inks, primer or protective/decorative coatings applied simultaneously to the plate and blanket of the first or any consecutive printing unit of any lithographic printing press.

BACKGROUND OF THE INVENTION

Conventional sheet-fed, rotary offset printing presses typically include one or more printing units through which individual sheets are fed and printed. After the last printing unit, freshly printed sheets are transferred by a delivery conveyor to the delivery end of the press where the freshly printed and/or coated sheets are collected and stacked uniformly. In a typical sheet-fed, rotary offset printing press such as the Heidelberg Speedmaster line of presses, the delivery conveyor includes a pair of endless chains carrying gripper bars with gripper fingers which grip and pull freshly printed sheets from the last impression cylinder and convey the sheets to the sheet delivery stacker.

Since the inks used with sheet fed rotary offset printing presses are typically wet and tacky, special precautions must be taken to prevent marking and smearing of the freshly printed or coated sheets as the sheets are transferred from one printing unit to another. The printed ink on the surface of the sheet dries relatively slowly and is easily smeared during subsequent transfer between printing units. Marking, smearing and smudging can be prevented by a vacuum-assisted sheet transfer apparatus as described in the following U.S. Pat. Nos: 5,113,255; 5,127,329; 5,205,217; 5,228,391; 5,243,909; and 5,419,254, all to Howard W. DeMoore, co-inventor, and manufactured and sold by Printing Research, Inc. of Dallas, Tex., U.S.A. under its trademark BACVAC™.

In some printing jobs, offsetting is prevented by applying a protective and/or decorative coating material over all or a portion of the freshly printed sheets. Some coatings are formed of a UV-curable or water-dispersed resin applied as a liquid solution over the freshly printed sheets to protect the ink from offsetting or set-off and improve the appearance of the freshly printed sheets. Such coatings are particularly desirable when decorative or protective finishes are applied in the printing of posters, record jackets, brochures, magazines, folding cartons and the like.

DESCRIPTION OF THE PRIOR ART

Various arrangements have been made for applying the coating as an in-line printing operation by using the last printing unit of the press as the coating application unit. For example, U.S Pat. Nos. 4,270,483, 4,685,414; and 4,779,557 disclose coating apparatus which can be moved into position to permit the blanket cylinder of the last printing unit of a printing press to be used to apply a coating material over the freshly printed sheets. In U.S. Pat. No. 4,841,903 (Bird) there are disclosed coating apparatus which can be selectively moved between the plate cylinder or the blanket cylinder of the last printing unit of the press so the last printing unit can only be used for coating purposes However, when coating apparatus of these types are being used, the last printing unit cannot be used to print ink to the sheets, but rather can only be used for the coating operation. Thus, while coating with this type of in-line coating apparatus, the printing press loses the capability of printing on the last printing unit as it is converted to a coating unit.

The coater of U.S. Pat. No. 5,107,790 (Sliker et al) is retractable along an inclined rail for extending and retracting a coater head into engagement with a blanket on the blanket cylinder. Because of its size, the rail-retractable coater can only be installed between the last printing unit of the press and the delivery sheet stacker, and cannot be used for interunit coating. The coater of U.S. Pat. No. 4,615,293 (Jahn) provides two separate, independent coaters located on the dampener side of a converted printing unit for applying lacquer to a plate and to a rubber blanket. Consequently, although a plate and blanket are provided, the coating unit of Jahn's press is restricted to a dedicated coating operation only.

Proposals have been made for overcoming the loss of a printing unit when in-line coating is used, for example as set forth in U.S. Pat. No. 5,176,077 to Howard W. DeMoore (co-inventor and assignee), which discloses a coating apparatus having an applicator roller positioned to apply the coating material to the freshly printed sheet while the sheet is still on the last impression cylinder of the press. This allows the last printing unit to print and coat simultaneously, so that no loss of printing unit capability results.

Some conventional coaters are rail-mounted and occupy a large amount of press space and reduce access to the press. Elaborate equipment is needed for retracting such coaters from the operative coating position to the inoperative position, which reduces access to the printing unit.

Accordingly, there is a need for an in-line inking/coating apparatus which does not result in the loss of a printing unit, does not extend the length of the press, and which can print and coat aqueous and flexographic inks and coating materials simultaneously onto the plate and blanket on any lithographic printing unit of any lithographic printing press, including the first printing unit.

OBJECTS OF THE INVENTION

Accordingly, a general object of the present invention is to provide improved inking/coating apparatus which is capable of selectively applying ink or coating material to a plate on a plate cylinder or ink or coating material to a plate or blanket on a blanket cylinder.

A specific object of the present invention is to provide improved inking/coating apparatus of the character described which is extendable into inking/coating engagement with either a plate on a plate cylinder or to a plate or blanket on a blanket cylinder.

A related object of the present invention is to provide improved inking/coating apparatus of the character described which is capable of being mounted on any lithographic printing unit of the press and does not interfere with operator access to the plate cylinder, blanket cylinder, or adjacent printing units.

Another object of the present invention is to provide improved inking/coating apparatus of the character described, which can be moved from an operative inking/coating engagement position adjacent to a plate cylinder or a blanket cylinder to a non-operative, retracted position.

Still another object of the present invention is to provide improved inking/coating apparatus of the character described, which can be used for applying aqueous, flexographic and ultra-violet curable inks and/or coatings in combination with lithographic, flexographic and waterless printing processes on any rotary offset printing press.

A related object of the present invention is to provide improved inking/coating apparatus of the character described which is capable of applying aqueous or flexographic ink or coating material on one printing unit, for example the first printing unit, and drying the ink or coating material before it is printed or coated on the next printing unit so that it can be overprinted or overcoated immediately on the next printing unit with waterless, aqueous, flexographic or lithographic inks or coating materials.

Yet another object of the present invention is to provide improved inking/coating apparatus for use on a multiple color rotary offset printing press that can apply ink or coating material separately and/or simultaneously to the plate and/or blanket of a printing unit of the press from a single operative position, and from a single inking/coating apparatus.

A related object of the present invention is to provide improved inking/coating apparatus of the character described, in which virtually no printing unit adjustment or alteration is required when the inking/coating apparatus is converted from plate to blanket printing or coating and vice versa.

Another object of the present invention is to provide improved inking/coating apparatus that can be operably mounted in the dampener space of any lithographic printing unit for inking/coating engagement with either a plate on a plate cylinder or a plate or blanket on a blanket cylinder, and which does not interfere with operator movement or activities in the interunit space between printing units.

SUMMARY OF THE INVENTION

The foregoing objects are achieved by a retractable, in-line inking/coating apparatus which is mounted on the dampener side of any printing unit of a rotary offset press for movement between an operative (on-impression) inking/coating position and a retracted, disengaged (off-impression) position. The inking/coating apparatus includes an applicator roller which is movable into and out of engagement with a plate on a plate cylinder or a blanket on a blanket cylinder. The inking/coating applicator head is pivotally coupled to a printing unit by pivot pins which are mounted on the press side frames in the traditional dampener space of the printing unit in parallel alignment with the plate cylinder and the blanket cylinder. This dampener space mounting arrangement allows the inking/coating unit to be installed between any adjacent printing units on the press.

In the preferred embodiment, the applicator head includes vertically spaced pairs of cradle members with one cradle pair being adapted for supporting an inking/coating applicator roller in alignment with a plate cylinder, and the other cradle pair supporting an inking/coating applicator roller in alignment with the blanket cylinder, respectively, when the applicator head is in the operative position. Because of the pivotal support provided by the pivot pins, the applicator head can be extended and retracted within the limited space available in the traditional dampener space, without restricting operator access to the printing unit cylinders and without causing a printing unit to lose its printing capability.

When the inking/coating apparatus is used in combination with a flexographic printing plate and aqueous or flexographic ink or coating material, the water component of the aqueous or flexographic ink or coating material on the freshly printed or coated sheet is evaporated and dried by a high velocity, hot air interunit dryer and a high volume heat and moisture extractor assembly so that the freshly printed ink or coating material is dry before the sheet is printed or coated on the next printing unit. This quick drying process permits a base layer or film of ink, for example opaque white or metallic (gold, silver or other metallics) ink to be printed on the first printing unit, and then overprinted on the next printing unit without back-trapping or dot gain.

The construction and operation of the present invention will be understood from the following detailed description taken in conjunction with the accompanying drawings which disclose, by way of example, the principles and advantages of the present invention.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a perspective view of a sheet fed, rotary offset printing press having inking/coating apparatus embodying the present invention;

FIG. **2** is a simplified perspective view of the single head, dual cradle inking/coating apparatus of the present invention;

FIG. **3** is a schematic side elevational view of the printing press of FIG. **1** having single head, dual cradle inking/coating apparatus installed in the traditional dampener position of the first, second and last printing units;

FIG. **4** is a simplified side elevational view showing the single head, dual cradle inking/coating apparatus in the operative inking/coating position for simultaneously printing on the printing plate and blanket on the fourth printing unit;

FIG. **5** is a simplified side elevational view showing the single head, dual cradle inking/coating apparatus in the operative position for spot or overall inking or coating on the blanket of the first printing unit, and showing the dual cradle inking/coating apparatus in the operative position for spot or overall inking or coating on the printing plate of the second printing unit;

FIG. **6** is a simplified side elevational view of the single head, dual cradle inking/coating apparatus of FIG. **4** and FIG. **5**, partially broken away, showing the single head, dual cradle inking/coating apparatus in the operative coating position and having a sealed doctor blade reservoir assembly for spot or overall coating on the blanket;

FIG. **7** is a schematic view showing a heat exchanger and pump assembly connected to the single head, dual cradle inking/coating apparatus for circulating temperature controlled ink or coating material to the inking/coating apparatus;

FIG. **8** is a side elevational view, partially broken away, and similar to FIG. **6** which illustrates an alternative coating head arrangement;

FIG. 9 is a simplified elevational view of a printing unit which illustrates pivotal coupling of the inking/coating apparatus on the printing unit side frame members;

FIG. 10 is a view similar to FIG. 2 in which a pair of split applicator rollers are mounted in the upper cradle and lower cradle, respectively;

FIG. 11 is a side elevational view of a split applicator roller;

FIG. 12 is a perspective view of a doctor blade reservoir which is centrally partitioned by a seal element;

FIG. 13 is a sectional view showing sealing engagement of the split applicator roller against the partition seal element of FIG. 12;

FIG. 14 is a view similar to FIG. 8 which illustrates an alternative inking/coating embodiment;

FIG. 15 is a simplified side elevational view of a substrate which has a bronzed-like finish which is applied by simultaneous operation of the dual applicator roller embodiment of FIG. 14,

FIG. 16 is a side elevational view, partly in section, of a pan roller having separate transfer surfaces mounted on a split fountain pan;

FIG. 17 is a simplified side elevational view of the dual cradle inking/coating apparatus, partially broken away, which illustrates an alternative inking/coating head apparatus featuring a single doctor blade assembly, anilox applicator roller mounted on the lower cradle; and

FIG. 18 is a side elevational view, partly in section, of a single doctor blade anilox applicator roller assembly having separate transfer surfaces, and a split fountain pan having separate fountain compartments, with the separate fountain compartments being supplied with different inks or coating materials from separate off-press sources.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

As used herein, the term "processed" refers to printing and coating methods which can be applied to either side of a substrate, including the application of lithographic, waterless, UV-curable, aqueous and flexographic inks and/or coatings. The term "substrate" refers to sheet and web material. Also, as used herein, the term "waterless printing plate" refers to a printing plate having image areas and non-image areas which are oleophilic and oleophobic, respectively. "Waterless printing ink" refers to an oil-based ink which does not contain a significant aqueous component. "Flexographic plate" refers to a flexible printing plate having a relief surface which is wettable by flexographic ink or coating material. "Flexographic printing ink or coating material" refers to an ink or coating material having a base constituent of either water, solvent or UV-curable liquid. "UV-curable lithographic printing ink and coating material" refers to oil-based printing inks and coating materials that can be cured (dried) photomechanically by exposure to ultraviolet radiation, and that have a semi-paste or gel-like consistency. "Aqueous printing ink or coating material" refers to an ink or coating material that predominantly contains water as a solvent, diluent or vehicle. A "relief plate" refers to a printing plate having image areas which are raised relative to non-image areas which are recessed.

As shown in the exemplary drawings, the present invention is embodied in a new and improved in-line inking/coating apparatus, herein generally designated **10**, for applying aqueous, flexographic or UV-curable inks or protective and/or decorative coatings to sheets or webs printed in a sheet-fed or web-fed, rotary offset printing press, herein generally designated **12**. In this instance, as shown in FIG. **1**, the inking/coating apparatus **10** is installed in a four unit rotary offset printing press **12**, such as that manufactured by Heidelberger Druckmaschinen AG of Germany under its designation Heidelberg Speedmaster SM102 (40", 102 cm).

The press **12** includes a press frame **14** coupled at one end, herein the right end, to a sheet feeder **16** from which sheets, herein designated S, are individually and sequentially fed into the press, and at the opposite end, with a sheet delivery stacker **20** in which the freshly printed sheets are collected and stacked. Interposed between the sheet feeder **16** and the sheet delivery stacker **20** are four substantially identical sheet-printing units **22**, **24**, **26** and **28** which can print four different colors onto the sheets as they are transferred through the press **12**. The printing units are housed within printing towers T1, T2, T3 and T4 formed by side frame members **14**, **15**. Each printing tower has a delivery side **25** and a dampener side **27**. A dampener space **29** is partially enclosed by the side frames on the dampener side of the printing unit.

As illustrated, the printing units **22**, **24**, **26** and **28** are substantially identical and of conventional design. The first printing unit **22** includes an in-feed transfer cylinder **30**, a plate cylinder **32**, a blanket cylinder **34** and an impression cylinder **36**, all supported for rotation in parallel alignment between the press side frames **14**, **15** which define printing unit towers T1, T2, T3 and T4. Each of the first three printing units **22**, **24** and **26** have a transfer cylinder **38** disposed to transfer the freshly printed sheets from the adjacent impression cylinder and transfer the freshly printed sheets to the next printing unit via an intermediate transfer drum **40**.

The last printing unit **28** includes a delivery cylinder **42** mounted on a delivery shaft **43**. The delivery cylinder **42** supports the freshly printed sheet **18** as it is transferred from the last impression cylinder **36** to a delivery conveyor system, generally designated **44**, which transfers the freshly printed sheet to the sheet delivery stacker **20**. To prevent smearing during transfer, a flexible covering is mounted on the delivery cylinder **42**, as described and claimed in U.S. Pat. No. 4,402,267 to Howard W. DeMoore, which is incorporated herein by reference. The flexible covering is manufactured and sold by Printing Research, Inc. of Dallas, Tex., U.S.A., under its trademark SUPER BLUE®. Optionally, a vacuum-assisted sheet transfer assembly manufactured and sold by Printing Research, Inc. of Dallas, Tex., U.S.A., under its trademark BACVAC® can be substituted for the delivery transfer cylinder **42** and flexible covering.

The delivery conveyor system **44** as shown in FIG. **2** is of conventional design and includes a pair of endless delivery gripper chains **46**, only one of which is shown carrying at regular spaced locations along the chains, laterally disposed gripper bars having gripper fingers used to grip the leading edge of a freshly printed or coated sheet **18** after it leaves the nip between the impression cylinder **36** and delivery cylinder **42** of the last printing unit **28**. As the leading edge is gripped by the gripper fingers, the delivery chains **46** pull the sheet away from the last impression cylinder **36** and convey the freshly printed or coated sheet to the sheet delivery stacker **20**.

Prior to reaching the delivery sheet stacker, the freshly printed and/or coated sheets S pass under a delivery dryer **48** which includes a combination of infra-red thermal radiation, high velocity hot air flow and a high performance heat and moisture extractor for drying the ink and/or the protective/

(FIG. 7), which may be a waterless printing plate or a flexographic printing plate. When the inking/coating apparatus is used for applying aqueous/flexographic ink or coating material to a waterless printing plate PW, the inking roller train **52** is not required, and is retracted away from the printing plate. Because the viscosity of aqueous/flexographic printing ink or coating material varies with temperature, it is necessary to heat or cool the aqueous/flexographic printing ink or coating material to compensate for ambient temperature variations to maintain the ink viscosity in a preferred operating range.

For example, the temperature of the printing press can vary from around 60° F. (15° C.) in the morning, to around 85° F. (29° C.) or more in the afternoon. The viscosity of aqueous/flexographic printing ink or coating material can be marginally high when the ambient temperature of the press is near 60° F. (15° C.), and the viscosity can be marginally low when the ambient temperature of the press exceeds 85° F. (29° C.). Consequently, it is desirable to control the temperature of the aqueous/flexographic printing ink or coating material so that it will maintain the surface temperature of waterless printing plates within the specified temperature range. Moreover, the ink/coating material temperature should be controlled to maintain the tack of the aqueous/flexographic printing ink or coating material within a desired range when the ink or coating material is being used in connection with flexographic printing processes.

The applicator roller **66** is preferably an anilox fluid metering roller which transfers measured amounts of printing ink or coating material to a plate or blanket. The surface of an anilox roller is engraved with an array of closely spaced, shallow depressions referred as "cells". Ink or coating from the reservoir **70** flows into the cells as the anilox roller turns through the reservoir. The transfer surface of the anilox roller is "doctored" (wiped or scraped) by dual doctor blades **68A**, **68B** to remove excess ink or coating material. The ink or coating metered by the anilox roller is that contained within the cells. The dual doctor blades **68A**, **68B** also seal the supply reservoir **70**.

The anilox applicator roller **66** is cylindrical and may be constructed in various diameters and lengths, containing cells of various sizes and shapes. The volumetric capacity of an anilox roller is determined by cell size, shape and number of cells per unit area. Depending upon the intended application, the cell pattern may be fine (many small cells per unit area) or coarse (fewer large cells per unit area).

By supplying the ink or coating material through the inking/coating apparatus **10**, more ink or coating material can be applied to the sheet S as compared with the inking roller train of a lithographic printing unit. Moreover, color intensity is stronger and more brilliant because the aqueous or flexographic ink or coating material is applied at a much heavier film thickness or weight than can be applied by the lithographic process, and the aqueous or flexographic colors are not diluted by dampening solution.

Preferably, the sealed doctor blade assembly **68** is constructed as described in U.S. Pat. No. 5,176,077 to Howard W. DeMoore, co-inventor and assignee, which is incorporated herein by reference. An advantage of using a sealed reservoir is that fast drying ink or coating material can be used. Fast drying ink or coating material can be used in an open fountain **53** (see FIG. **8**); however, open air exposure causes the water and solvents in the fast-drying ink or coating material to evaporate faster, thus causing the ink or coating material to dry prematurely and change viscosity. Moreover, an open fountain emits unwanted odors into the press room. When the sealed doctor blade assembly is utilized, the pump (FIG. **7**) which circulates ink or coating material to the doctor blade head is preferably a peristaltic pump, which does not inject air into the feeder lines which supply the ink or coating reservoir **70** and helps to prevent the formation of air bubbles and foam within the ink or coating material.

An inking/coating apparatus **10** having an alternative applicator roller arrangement is illustrated in FIGS. **10–13**. In this arrangement, the engraved metering surface of the anilox applicator rollers **66**, **67** are partitioned by smooth seal surfaces **66C** which separates a first engraved peripheral surface portion **66A** from a second engraved peripheral surface portion **66B**. Likewise, smooth seal surfaces **66D**, **66E** are formed on the opposite end portions of the applicator roller **66** for engaging end seals **134**, **136** (FIG. **12**) of the doctor blade reservoir. The upper applicator roller **67** has engraved anilox metering surfaces **67A** and **67B** which are separated by a smooth seal band **67C**.

Referring now to FIG. **12** and FIG. **13**, the reservoir **70** of the doctor blade head **68** is partitioned by a curved seal element **130** to form two separate chambers **70A**, **70B**. The seal element **130** is secured to the doctor blade head within an annular groove **132**. The seal element **130** is preferably made of polyurethane foam or other durable, resilient foam material. The seal element **130** is engaged by the seal band **66**, thus forming a rotary **30** seal which blocks the leakage of ink or coating material from one reservoir chamber into the other reservoir chamber. Moreover, the seal band provides an unprinted or uncoated area which separates the printed or coated areas from each other, which is needed for work and turn printing jobs or other printing jobs which print two or more separate images onto the same substrate.

Another advantage of the split applicator roller embodiment is that it enables two or more flexographic inks or coating materials to be printed simultaneously within the same lithographic printing unit. That is, the reservoir chambers **70A**, **70B** of the upper doctor blade assembly can be supplied with gold ink and silver ink, for example, while the reservoir chambers **70A**, **70B** of the lower doctor blade assembly can be supplied with inks of two additional colors, for example opaque white ink and blue ink. This permits the opaque white ink to be overprinted with the gold ink, and the blue ink to be overprinted with the silver ink on the same printing unit on any lithographic press.

Moreover, a catalyst can be used in the upper doctor blade reservoir and a reactive ink or coating material can be used in the lower doctor blade reservoir. This can provide various effects, for example improved chemical resistance and higher gloss levels.

The split applicator roller sections **67A**, **67B** in the upper cradle position can be used for applying two separate inks or coating materials simultaneously, for example flexographic, aqueous and ultra-violet curable inks or coating materials, to separate surface areas of the plate, while the lower applicator roller sections **66A**, **66B** can apply an initiator layer and a microencapsulated layer simultaneously to separate blanket surface areas. Optionally, the metering surface portions **66A**, **66B** can be provided with different cell metering capacities for providing different printing effects which are being printed simultaneously. For example, the screen line count on one half-section of an anilox applicator roller is preferably in the range of 200–600 lines per inch (79–236 lines per cm) for half-tone images, and the screen line count of the other half-section is preferably in the range of 100–300 lines per inch (39–118 lines per cm) for overall coverage, high

weight applications such as opaque white. This split arrangement in combination with dual applicator rollers is particularly advantageous when used in connection with "work and turn" printing jobs.

Referring again to FIG. **8**, instead of using the sealed doctor blade reservoir assembly **68** as shown in FIG. **6**, an open fountain assembly **69** is provided by the fountain pan **53** which contains a volume of liquid ink Q or coating material. The liquid ink or coating material is transferred to the applicator roller **66** by a pan roller **55** which turns in contact with ink Q or coating material in the fountain pan. If a split applicator roller is used, the pan roller **55** is also split, and the pan is divided into two pan sections **53A, 53B** by a separator plate **53P**, as shown in FIG. **16**.

In the alternative embodiment of FIG. **16**, the pan roller **55** is divided into two pan roller sections **55A, 55B** by a centrally located, annular groove **59**. The separator plate **53P** is received within and centrally aligned with the groove **59**, but does not touch the adjoining roller faces. By this arrangement, two or more inks or coating materials Q1, Q2 are contained within the open pan sections **55A, 55B** for transfer by the split pan roller sections **53A, 53B**, respectively. This permits two or more flexographic inks or coating materials to be transferred to two separate image areas on the plate or on the blanket of the same printing unit. This arrangement is particularly advantageous for work and turn printing jobs or other printing jobs which print two or more separate images onto the same substrate.

The frame **60** of the inking/coating apparatus **10** includes side support members **74, 76** which support the applicator roller **66**, gear train **64**, gear train **65**, doctor blade assembly **68** and the drive motor **62**. The applicator roller **66** is mounted on stub shafts **63A, 63B** which are supported at opposite ends on a lower cradle assembly **100** formed by a pair of side support members **78, 80** which have sockets **79, 81** and retainer caps **101, 103**. The stub shafts are received in roller bearings **105, 107** which permit free rotation of the applicator roller **66** about its longitudinal axis A1 (axis A2 in the upper cradle). The retainer caps **101, 103** hold the stub shafts **63A, 63B** and bearings **105, 107** in the sockets **79, 81** and hold the applicator roller **66** in parallel alignment with the pivot axis X.

The side support members **74, 76** also have an upper cradle assembly **102** formed by a pair of side support members **82, 84** which are vertically spaced with respect to the lower side plates **78, 80**. Each cradle **100, 102** has a pair of sockets **79, 81** and **83, 85**, respectively, for holding an applicator roller **66, 67** for spot coating or inking engagement with the printing plate P on the plate cylinder **32** (FIG. **4**) or with a printing plate P or a blanket B on the blanket cylinder **34**.

Preferably, the applicator roller **67** (FIG. **8**, FIG. **9**) the upper cradle (plate) position is an anilox roller having a resilient transfer surface. In the dual cradle arrangement as shown in FIG. **2**, the press operator can quickly change from blanket inking/coating to plate inking/coating within minutes, since it is only necessary to release, remove and reposition or replace the applicator roller **66**.

The capability to simultaneously print in the flexographic mode, the aqueous mode, the waterless mode, or the lithographic mode on different printing units of the same lithographic press and to print or coat from either the plate position or the blanket position on any one of the printing units is referred to herein as the LITHOFLEX™ printing process or system. LITHOFLEX™ is a trademark of Printing Research, Inc. of Dallas, Tex., U.S.A., exclusive licensee of the present invention.

Referring now to FIG. **14**, an inking/coating apparatus **10** having an inking/coating assembly **109** of an alternative design is installed in the upper cradle position for applying ink and/or coating material to a plate P on the plate cylinder **32**. According to this alternative embodiment, an applicator roller **67R** having a resilient transfer surface is coupled to an anilox fluid metering roller which transfers measured amounts of printing ink or coating material to the plate P. The anilox roller **111** has a transfer surface constructed of metal, ceramic or composite material which is engraved with cells. The resilient applicator roller **67R** is interposed in transfer engagement with the plate P and the metering surface of the anilox roller **111**. The resilient transfer surface of the applicator roller **67R** provides uniform, positive engagement with the plate.

Referring now to FIG. **17**, an inking/coating apparatus **10** having an alternative inking/coating assembly **113** is installed in the lower cradle assembly **100** for applying flexographic or aqueous ink and/or coating material Q to a plate or blanket mounted on the blanket cylinder **34**. Instead of using the sealed, dual doctor blade reservoir assembly **68** as shown in FIG. **6**, an open, single doctor blade anilox roller assembly **113** is supplied with liquid ink Q or coating material contained in an open fountain pan **117**. The liquid ink or coating material Q is transferred to the engraved transfer surface of the anilox roller **66** as it turns in the fountain pan **117**. Excess ink or coating material Q is removed from the engraved transfer surface by a single doctor blade **68B**. The liquid ink or coating material Q is pumped from an off-press source, for example the drum **73** shown in FIG. **17**, through a supply conduit **119** into the fountain pan **117** by a pump **120**.

For overall inking or coating jobs, the metering transfer surface of the anilox roller **66** extends over its entire peripheral surface. However, for certain printing jobs which print two or more separate images onto the same substrate, for example work and turn printing jobs, the metering transfer surface of the anilox applicator roller **66** is partitioned by a centrally located, annular undercut groove **66C** which separates first and second metering transfer surfaces **66A, 66B** as shown in FIG. **11** and FIG. **18**.

The single doctor blade **68B** has an edge **68E** which wipes simultaneously against the split metering transfer surfaces **66A, 66B**. In this single blade, split anilox roller embodiment **113**, it is necessary to provide dual supply sources, for example drums **73A, 73B**, dual supply lines **119A, 119B**, and dual pumps **120A, 120B**. Moreover, the fountain pan **117** is also split, and the pan **117** is divided into two pan sections **117A, 117B** by a separator plate **121**, as shown in FIG. **18**. The separator plate **121** is centrally aligned with the undercut groove **66C**, but does not touch the adjoining roller faces.

Although the single blade, split anilox applicator roller assembly **113** is shown mounted in the lower cradle position (FIG. **17**), it should be understood that the single blade, split anilox applicator roller assembly **113** can be mounted and used in the upper cradle position, as well.

According to another aspect of the present invention, the inking/coating apparatus **10** is pivotally coupled on horizontal pivot pins **88P, 90P** which allows the single head, dual cradle inking/coating apparatus **10** to be mounted on any lithographic printing unit. Referring to FIG. **9**, the horizontal pivot pins **88P, 90P** are mounted within the traditional dampener space **29** of the printing unit and are secured to the press side frames **14, 15**, respectively. Preferably, the pivot support pins **88P, 90P** are secured to the press side frames by

a threaded fastener. The pivot-support-pins are received within circular openings **88, 90** which intersect the side support members **74, 76** of the inking/coating apparatus **10**. The horizontal support pins **88P, 90P** are disposed in parallel alignment with rotational axis X and with the plate cylinder and blanket cylinder, and are in longitudinal alignment with each other.

Preferably, the pivot pins **88P, 90P** are located in the dampener space **29** so that the rotational axes A1, A2 of the applicator rollers **66, 67** are elevated with respect to the nip contact points N1, N2. By that arrangement, the transfer point between the applicator roller **66** and a blanket on the blanket cylinder **34** (as shown in FIG. **8**) and the transfer point between the applicator roller **66** and a plate on the plate cylinder **32** (as shown in FIG. **5**) are above the radius lines R1, R2 of the plate cylinder and the blanket cylinder, respectively. This permits the inking/coating apparatus **10** to move clockwise to retract the applicator roller **66** to an off-impression position relative to the blanket cylinder in response to a single extension stroke of the power actuator arms **104A, 106A**. Similarly, the applicator roller **66** is moved counterclockwise to the on-impression operative position as shown in FIGS. **4, 5, 6** and **8** by a single retraction stroke of the actuator arms **104A, 106A**, respectively.

Preferably, the pivot pins are made of steel and the side support members are made of aluminum, with the steel pivot pins and the aluminum collar portion bordering the circular openings **88, 90** forming a low friction journal. By this arrangement, the inking/coating apparatus **10** is freely rotatable clockwise and counterclockwise with respect to the pivot pins **88P, 90P**. Typically, the arc length of rotation is approximately 60 mils (about 1.5 mm). Consequently, the inking/coating apparatus **10** is almost totally enclosed within the dampener space **29** of the printing unit in the on-impression position and in the off-impression position.

The cradle assemblies **100** and **102** position the applicator roller **66** in inking/coating alignment with the plate cylinder or blanket cylinder, respectively, when the inking/coating apparatus **10** is extended to the operative (on-impression) position. Moreover, because the inking/coating apparatus **10** is installed within the dampener space **29**, it is capable of freely rotating through a small arc while extending and retracting without being obstructed by the press side frames or other parts of the printing press. This makes it possible to install the inking/coating apparatus **10** on any lithographic printing unit. Moreover, because of its internal mounting position within the dampener space **29**, the projection of the inking/coating apparatus **10** into the space between printing units is minimal. This assures unrestricted operator access to the printing unit when the applicator head is in the operative (on-impression) and retracted (off-impression) positions.

As shown in FIG. **4** and FIG. **5**, movement of the inking/coating apparatus **10** is counterclockwise from the retracted (off-impression) position to the operative (on-impression) position.

Although the dampener side installation is preferred, the inking/coating apparatus **10** can be adapted for operation on the delivery side of the printing unit, with the inking/coating apparatus being movable from a retracted (off-impression) position to an on-impression position for engagement of the applicator roller with either a plate on the plate cylinder or a blanket on the blanket cylinder on the delivery side **25** of the printing unit

Movement of the inking/coating apparatus **10** to the operative (on-impression) position is produced by power actuators, preferably double-acting pneumatic cylinders **104, 106** which have extendable/retractable power transfer arms **104A, 106A**, respectively. The first pneumatic cylinder **104** is pivotally coupled to the press frame **14** by a pivot pin **108**, and the second pneumatic cylinder **106** is pivotally coupled to the press frame **15** by a pivot pin **110**. In response to selective actuation of the pneumatic cylinders **104, 106**, the power transfer arms **104A, 106A** are extended or retracted. The power transfer arm **104A** is pivotally coupled to the side support member **74** by a pivot pin **112**. Likewise, the power transfer arm **106A** is pivotally coupled to the side support member **76** by a pivot pin **114**.

As the power arms extend, the inking/coating apparatus **10** is rotated clockwise on the pivot pins **88P, 90P**, thus moving the applicator roller **66** to the off-impression position. As the power arms retract, the inking/coater apparatus **60** is rotated counterclockwise on the pivot pins **88P, 90P**, thus moving the applicator roller **66** to the on-impression position. The torque applied by the pneumatic actuators is transmitted to the inking/coating apparatus **10** through the pivot pin **112** and pivot pin **114**.

Fine adjustment of the on-impression position of the applicator roller relative to the plate cylinder or the blanket cylinder, and of the pressure of roller engagement, is provided by an adjustable stop assembly **115**. The adjustable stop assembly **115** has a threaded bolt **116** which is engagable with a bell crank **118**.

The bell crank **118** is pivotally coupled to the side support member **74** on a pin **120**. One end of the bell crank **118** is engagable by the threaded bolt **116**, and a cam roller **122** is mounted for rotation on its opposite end. The striking point of engagement is adjusted by rotation of the bolt **116** so that the applicator roller **66** is properly positioned for inking/coating engagement with the plate P or blanket B and provides the desired amount of inking/coating pressure when the inking/coating assembly **60** is moved to the operative position.

This arrangement permits the in-line inking/coating apparatus to operate effectively without encroaching in the interunit space between any adjacent printing units, and without blocking or obstructing access to the cylinders of the printing units when the inking/coating apparatus is in the extended (off-impression) position or retracted (on-impression) position. Moreover, when the in-line inking/coating apparatus is in the retracted position, the doctor blade reservoir and coating circulation lines can be drained and flushed automatically while the printing press is running as well as when the press has been stopped for change-over from one job to another or from one type of ink or coating to another.

Substrates which are printed or coated with aqueous flexographic printing inks require high velocity hot air for drying. When printing a flexographic ink such as opaque white or metallic gold, it is always necessary to dry the printed substrates between printing units before overprinting them. According to the present invention, the water component on the surface of the freshly printed or coated substrate S is evaporated and dried by high velocity, hot air interunit dryer and high volume heat and moisture extractor units **124, 126** and **128**, as shown in FIG. **2**, FIG. **4** and FIG. **5**. The dryer/extractor units **124, 126** and **128** are oriented to direct high velocity heated air onto the freshly printed/coated substrates as they are transferred by the impression cylinder **36** and the intermediate transfer drum **40** of one printing unit and to another transfer cylinder **30** and to the impression cylinder **36** of the next printing unit. By that

arrangement, the freshly printed flexographic ink or coating material is dried before the substrate S is overprinted by the next printing unit.

The high velocity, hot air dryer and high performance heat and moisture extractor units **124**, **126** and **128** utilize high velocity air jets which scrub and break-up the moist air layer which clings to the surface of each freshly printed or coated sheet or web. Within each dryer, high velocity air is heated as it flows across a resistance heating element within an air delivery baffle tube. High velocity jets of hot air are discharged through multiple airflow apertures into an exposure zone Z (FIG. **4** and FIG. **5**) and onto the freshly printed/coated sheet S as it is transferred by the impression cylinder **36** and transfer drum **40**, respectively.

Each dryer assembly includes a pair of air delivery dryer heads **124**D, **126**D and **128**D which are arranged in spaced, side-by-side relationship. The high velocity, hot air dryer and high performance heat and moisture extractor units **124**, **126** and **128** are preferably constructed as disclosed in co-pending U.S. patent application Ser. No. 08/132,584, filed Oct. 6, 1993, entitled "High Velocity Hot Air Dryer", to Howard W. DeMoore, co-inventor and assignee of the present invention, and which is incorporated herein by reference, and which is marketed by Printing Research, Inc. of Dallas, Tex., U.S.A., under its trademark SUPER BLUE HV™.

The hot moisture-laden air displaced from the surface of each printed or coated sheet is extracted from the dryer exposure zone Z and exhausted from the printing unit by the high volume extractors **124**, **126** and **128**. Each extractor head includes an extractor manifold **124**E, **126**E and **128**E coupled to the dryer heads **124**D, **126**D and **128**D and draws the moisture, volatiles, odors and hot air through a longitudinal air gap G between the dryer heads. Best results are obtained when extraction is performed simultaneously with drying. Preferably, an extractor is closely coupled to the exposure zone Z at each dryer location as shown in FIG. **4**. Extractor heads **124**E, **126**E and **128**E are mounted on the dryer heads **124**D, **126**D and **128**D, respectively, with the longitudinal extractor air gap G facing directly into the exposure zone Z. According to this arrangement, each printed or coated sheet is dried before it is printed on the next printing unit.

The aqueous water-based inks used in flexographic printing evaporate at a relatively moderate temperature provided by the interunit high velocity hot air dryers/extractors **124**, **126** and **128**. Sharpness and print quality are substantially improved since the flexographic ink or coating material is dried before it is overprinted on the next printing unit. Since the freshly printed flexographic ink is dry, dot gain is substantially reduced and back-trapping on the blanket of the next printing unit is virtually eliminated. This interunit drying/extracting arrangement makes it possible to print flexographic inks such as metallic ink and opaque white ink on the first printing unit, and then dry-trap and overprint on the second and subsequent printing units.

Moreover, this arrangement permits the first printing unit **22** to be used as a coater in which a flexographic, aqueous or UV-curable coating material is applied to the lowest grade substrate such as recycled paper, cardboard, plastic and the like, to trap and seal-in lint, dust, spray powder and other debris and provide a smoother, more durable printing surface which can be overprinted on the next printing unit.

A first down (primer) aqueous coating layer seals-in the surface of a low grade, rough substrate, for example, recycled paper or plastic, and improves overprinted dot definition and provides better ink lay-down while preventing strike-through and show-through. A flexographic UV-curable coating material can then be applied downstream over the primer coating, thus producing higher coating gloss.

Preferably, the applicator roller **66** is constructed of composite carbon fiber material, metal or ceramic-coated metal when it is used for applying ink or coating material to the blanket B or other resilient material on the blanket cylinder **34**. When the applicator roller **66** is applied to the plate, it is preferably constructed as an anilox roller having a resilient, compressible transfer surface. Suitable resilient roller surface materials include Buna N synthetic rubber and EPDM (terpolymer elastomer). EPDM is known to be completely acceptable for use with UV-curable inks and coating applications.

A demonstration resilient anilox roller was made by covering a steel core with about ½ inch of rubber to a diameter of about four inches. The rubber had a hardness of about 80 on the Shore "A" scale. The surface was laser engraved by Consolidated Engravers, 2255 West Longhorn Dr., Lancaster, Tex. 76134 with four different patterns in approximately 10 inch wide bands across the face comprising about 125,150,175 and 200 lines/inch with what was a "hexagonal" cell pattern. Satisfactory coatings were applied via the plate cylinder to a substrate with all four patterns. A second resilient anilox roll was obtained which had only one 150 lines/inch overall pattern with a cell volume of about 9 cubic billion microns (CBM). Satisfactory coating was applied from this roll against a plate. Coating was applied to the roll by a sealed doctor blade assembly like assembly **68** in FIG. **6**. The roller produced useful film weight. Water based inks were applied satisfactorily in various colors. The surface speed of the plate and resilient anilox rollers were kept about the same. No reason is seen why a roller train similar to fountian assembly **69** in FIG. **8** could not be used to supply coating to a resilient anilox roller **66**. The resilient anilox roller will accommodate slight variations in elevation of a printing plate or blanket much better than a ceramic or hard surface anilox roller.

It has been demonstrated in prototype testing that the inking/coating apparatus **10** can apply a wide range of ink and coating types, including fluorescent (Day Glo), pearlescent, metallics (gold, silver and other metals), glitter, scratch and sniff (micro-encapsulated fragrance), scratch and reveal, luminous, pressure-sensitive adhesives and the like, as well as UV-curable and aqueous coatings.

With the dampener assembly removed from the printing unit, the inking/coating apparatus **10** can easily be installed in the dampener space for selectively applying flexographic inks and/or coatings to a flexographic or waterless printing plate or to the blanket. Moreover, overprinting of the flexographic inks and coatings can be performed on the next printing unit since the flexographic inks and/or coatings are dried by the high velocity, hot air interunit dryer and high volume heat and moisture extractor assembly of the present invention or by Ultra Violet curing.

The flexographic inks and coatings as used in the present invention contain colored pigments and/or soluble dyes, binders which fix the pigments onto the surface of the substrate, waxes, defoamers, thickeners and solvents. Aqueous-printing inks predominantly contain water as a diluent and/or vehicle. The thickeners which are preferred include algonates, starch, cellulose and its derivatives, for example cellulose esters or cellulose ethers and the like. Coloring agents including organic as well as inorganic pigments may

be derived from dyes which are insoluble in water and solvents. Suitable binders include acrylates and/or polyvinylchloride.

When metallic inks are printed, the cells of the anilox roller must be appropriately sized to prevent the metal particles from getting stuck within the cells. For example, for metallic gold ink, the anilox roller should have a screen line count in the range of 175–300 lines per inch (68-118 lines per cm). Preferably, in order to keep the anilox roller cells clear, the doctor blade assembly **68** is equipped with a bristle brush BR (FIG. **14**) as set forth in U.S. Pat. No. 5,425,809 to Steven M. Person, assigned to Howard W. DeMoore, and licensed to Printing Research, Inc. of Dallas, Tex., U.S.A., which is incorporated herein by reference.

The inking/coating apparatus **10** can also apply UV-curable inks and coatings. If UV-curable inks and coatings are utilized, ultra-violet dryers/extractors are installed adjacent to the high velocity hot air dryer/extractor units **124**, **126** and **128**, respectively.

It will be appreciated that the LITHOFLEX™ printing process described herein makes it possible to selectively operate a printing unit of a press in the lithographic printing mode while simultaneously operating another printing unit of the same press in either the flexographic printing mode or in the waterless printing mode, while also providing the capability to print or coat, separately or simultaneously, from either the plate position or the blanket position. The dual cradle support arrangement of the present invention makes it possible to quickly change over from inking/coating on the blanket cylinder position to inking/coating on the plate cylinder position with minimum press down-time, since it is only necessary to remove and reposition or replace the applicator roller **66** while the inking/coating apparatus **10** is in the retracted position. It is only necessary to remove four cap screws, lift the applicator roller **66** from the cradle, and reposition it in the other cradle. All of this can be accomplished in a few minutes, without removing the inking/coating apparatus **10** from the press.

It is possible to spot coat or overall coat from the plate position or from the blanket position with flexographic inks or coatings on one printing unit and then spot coat or overall coat with UV-curable inks or coatings from the plate position or from the blanket position on another printing unit during the same press run. Moreover, the press operator can spot or overall coat from the plate for one job, and then spot and/or overall coat from the blanket on the next job.

The positioning of the applicator roller relative to the plate or blanket is repeatable to a predetermined preset operative position. Consequently, only minor printing unit modifications or alterations may be required for the LITHOFLEX™ process. Although automatic extension and retraction have been described in connection with the exemplary embodiment, extension to the operative (on-impression) position and retraction to a non-operative (off-impression) position can be carried out manually, if desired. In the manual embodiment, it is necessary to latch the inking/coating apparatus **10** to the press side frames **14**, **15** in the operative (on-impression) position, and to mechanically prop the inking/coating apparatus in the off-impression (retracted) position.

Referring again to FIG. **8**, an applicator roller **66** is mounted on the lower cradle assembly **100** by side support members **78**, **80**, and a second applicator roller **66** is mounted on the upper cradle assembly **102** by side support members **82**, **84**. According to this arrangement, the inking/coating apparatus **10** can apply printing ink and/or coating material to a plate on the plate cylinder, while simultaneously applying printing ink and/or coating material to a plate or a blanket on the blanket cylinder of the same printing unit. When the same color ink is used by the upper and lower applicator rollers from the plate position and from the blanket position simultaneously on the same printing unit, a "double bump" or double inking films or coating layers are applied to the substrate S during a single pass of the substrate through the printing unit. The tack of the two inks or coating materials must be compatible for good transfer during the double bump. Moreover, the inking/coating apparatus **10** can be used for supplying ink or coating material to the blanket cylinder of a rotary offset web press, or to the blanket of a dedicated coating unit.

According to conventional bronzing techniques, a metallic (bronze) powder is applied off-line to previously printed substrate which produces a grainy, textured finish or appearance. The on-line application of bronze material by conventional flexographic or lithographic printing will only produce a smooth, continuous appearance. However, a grainy, textured finish is preferred for highest quality printing which, prior to the present invention, could only be produced by off-line methods.

Referring now to FIG **14** and FIG. **15**, metallic ink or coating material is applied on-line to the substrate S by simultaneous operation of the upper and lower applicator rollers **67R**, **66** to produce an uneven surface finish having a bronze-like textured or grainy appearance. According to the simulated bronzing method of the present invention, the flexographic bronze ink is applied simultaneously to the plate and to the blanket by the dual cradle inking/coating apparatus **10** as shown in FIG. **14**. A resilient applicator roller **67R** is mounted in the upper cradle **102**, and an anilox applicator roller **66** is mounted on the lower cradle **100**. The rollers are supplied from separate doctor blade reservoirs **70**. The doctor blade reservoir **70** in the upper cradle position supplies bronze ink or coating material having relatively coarse, metallic particles **140** dispersed in aqueous or flexographic ink. The coarse particle ink or coating material is applied to the plate P by the resilient applicator roller **67R** in the upper cradle position **102**. At the same time, flexographic and/or bronze ink or coating material having relatively fine, metallic particles **142** is transferred to the blanket B by the anilox roller **66** which is mounted on the lower cradle **100**.

The metering surfaces of the upper and lower applicator rollers have different cell sizes and volumetric capacities which accommodate the coarse and fine metallic particles. For example, the anilox roller **111** mounted in the upper cradle position **102** which transfers the coarse metallic particles **140** preferably has a screen line count in the range of 100–300 lines per inch (39–118 lines per cm), and the metering surface of the anilox roller **66** mounted on the lower cradle **100** which transfers the relatively fine metallic particles **142** preferably has a screen line count in the range of 200–600 lines per inch (79–236 lines per cm).

After transfer from the plate to the blanket, the fine metallic particles **142** form a layer over the coarse metallic particles **140**. As both bronze layers are offset onto the substrate S, the layer of fine metallic particles **142** is printed onto the substrate S with the top layer of coarse metallic particles **140** providing a textured, grainy appearance. The fine metallic particles **142** cover the substrate which would otherwise be visible in the gaps between the coarse metallic particles **140**. The combination of the coarse particle layer over the fine particle layer thus provides a textured, bronze-like finish and appearance.

Particulate materials other than metal can be used for producing a textured finish. For example, coarse and fine particles of metallized plastic (glitter), mica particles (pearlescent) and the like, can be substituted for the metallic particles for producing unlimited surface variations, appearances and effects. All of the particulate material, including the metallic particles, are preferably in solid, flat platelet form, and have a size dimension suitable for application by an anilox applicator roller. other particulate or granular material, for example stone grit having irregular form and size, can be used to good advantage.

Solid metal particles in platelet form, which are good reflectors of light, are preferred for producing the bronzed-like appearance and effect. However, various textured finishes, which could have light-reflective properties, can be produced by using granular materials such as stone grit. Most commonly used metals include copper, zinc and aluminum. other ductile metals can be used, if desired. Moreover, the coarse and fine particles need not be made of the same particulate material. Various effects and textured appearances can be produced by utilizing diverse particulate materials for the coarse particles and the fine particles, respectively. Further, either fine or coarse particle ink or coating material can be printed from the upper cradle position, and either fine or coarse particle ink or coating material can be printed from the lower cradle position, depending on the special or surface finish that is desired.

It will be appreciated that the last printing unit **28** can be configured for additional inking/coating capabilities which include lithographic, waterless, aqueous and flexographic processes. Various substrate surface effects (for example double bump or triple bump inking/coating or bronzing) can be performed on the last printing unit. For triple bump inking/coating, the last printing unit **28** is equipped with an auxiliary in-line inking or coating apparatus **97** as shown in FIG. **3** and FIG. **4**. The in-line inking or coating apparatus **97** allows the application of yet another film of ink or a protective or decorative layer of coating material over any freshly printed or coated surface effects or special treatments, thereby producing a triple bump. The triple bump is achieved by applying a third film of ink or layer of coating material over the freshly printed or coated double bump simultaneously while the substrate is on the impression cylinder of the last printing unit.

When the in-line inking/coating apparatus **97** is installed, it is necessary to remove the SUPER BLUE® flexible covering from the delivery cylinder **42**, and it is also necessary to modify or convert the delivery cylinder **42** for inking/coating service by mounting a plate or blanket B on the delivery cylinder **42**, as shown in FIG. **3** and FIG. **4**. Packing material is placed under the plate or blanket B, thereby packing the plate or blanket B at the correct packed-to-print radial clearance so that ink or coating material will be printed or coated onto the freshly printed substrate S as it transfers through the nip between the plate or blanket B on the converted delivery cylinder **42** and the last impression cylinder **36**. According to this arrangement, a freshly printed or coated substrate is overprinted or overcoated with a third film or layer of ink or coating material simultaneously while a second film or layer of ink or coating material is being over-printed or over-coated on the last impression cylinder **36**.

The auxiliary inking/coating apparatus **97** and the converted or modified delivery cylinder **42** are mounted on the delivery drive shaft **43**. The inking/coating apparatus **97** includes an applicator roller, preferably an anilox applicator roller **97A**, for supplying ink or coating material to a plate or blanket B on the modified or converted delivery cylinder **42**. The in-line inking/coating apparatus **97** and the modified or converted delivery cylinder **42** are preferably constructed as described in U.S. Pat. No. 5,176,077 to Howard W. DeMoore (co-inventor and assignee), which is hereby incorporated by reference. The in-line inking/coating apparatus **97** is manufactured and sold by Printing Research, Inc. of Dallas, Tex., U.S.A., under its trademark SUPER BLUE EZ COATER.™

After the delivery cylinder **42** has been modified or converted for inking/coating service, and because of the reduced nip clearance imposed by the plate or blanket B, the modified delivery cylinder **42** can no longer perform its original function of guiding and transferring the freshly printed or coated substrate. Instead, the modified or converted delivery cylinder **42** functions as a part of the inking/coating apparatus **97** by printing or coating a third down film of ink or layer of coating material onto the freshly printed or coated substrate as it is simultaneously printed or coated on the last impression cylinder **36**. Moreover, the mutual tack between the second down ink film or coating layer and the third down ink film or coating layer causes the overprinted or overcoated substrate to cling to the plate or blanket, thus opposing or resisting separation of the substrate from the plate or blanket.

To remedy this problem, a vacuum-assisted transfer apparatus **99** is mounted adjacent the modified or converted delivery cylinder **42** as shown in FIG. **3** and FIG. **4**. Another purpose of the vacuum-assisted transfer apparatus **99** is to separate the freshly overprinted or overcoated triple bump substrate from the plate or blanket B as the substrate transfers through the nip. The vacuum-assisted transfer apparatus **99** produces a pressure differential across the freshly overprinted or overcoated substrate as it transfers through the nip, thus producing a separation force onto the substrate and providing a clean separation from the plate or blanket B.

The vacuum-assisted transfer apparatus **99** is preferably constructed as described in U.S. Pat. Nos. 5,113,255; 5,127,329; 5,205,217; 5,228,391; 5,243,909; and 5,419,254, all to Howard W. DeMoore, co-inventor, which are incorporated herein by reference. The vacuum-assisted transfer apparatus **99** is manufactured and sold by Printing Research, Inc. of Dallas, Tex., U.S.A. under its trademark BACVAC™.

Although the present invention and its advantages have been described in detail, it should be understood that various changes, substitutions and alterations can be made herein without departing from the spirit and scope of the present invention as defined by the appended claims.

What is claimed is:

1. In a rotary offset printing press having first and second side frame members and a plurality of printing units each having a plate cylinder, a blanket cylinder, and an impression cylinder supported for rotation in operable combination, the printing units having a delivery side and a dampener side opposite the delivery side, an interunit operator space between printing units and a dampener or a space for a dampener on the dampener side of each unit, the improvement comprising:

a printing apparatus for inking or coating, the printing apparatus having a frame movably coupled to at least one printing unit in the space for a dampener, the printing apparatus being movable between an on-impression operative position and an off-impression retracted position;

the movable frame supporting a removable first applicator roller and a removable second applicator roller, the first

applicator roller, being supported for adjustment into and out of ink or coating association with the plate cylinder and the second applicator roll being supported for adjustment into and out of ink or coating association with the blanket cylinder, when the printing apparatus is moved respectively to the on-impression operative position and the off-impression retracted position;

whereby a continuous or spot film of ink or coating can be applied simultaneously by the printing apparatus to a plate on the plate cylinder and the blanket cylinder and ink or coating can be selectively applied to the plate cylinder or blanket cylinder or a plate mounted thereon if one of the first or second applicator rollers is removed from the frame.

2. The invention as set forth in claim 1 wherein the printing apparatus includes:

a doctor blade assembly having a reservoir for receiving ink or coating material coupled to the first or second applicator roll.

3. The invention as set forth in claim 2, the applicator roller comprising:

a roller having a resilient transfer surface.

4. The invention as set forth in claim 1, including:

first and second pivot pins mounted on the first and second side frame members, respectively, said pivot pins extending in alignment with the rotational axis of the plate and blanket cylinders; and

the printing apparatus being pivotally coupled for rotational movement on the pivot pins.

5. The invention as set forth in claim 1, further comprising:

a power actuator pivotally coupled to the printing unit, the power actuator having a power transfer arm which is extendable and retractable; and,

apparatus coupled to the power transfer arm and to the printing apparatus for converting extension or retraction movement of the power transfer arm into pivotal movement of the printing apparatus relative to the plate and blanket cylinder.

6. The invention as set forth in claim 5, in which the movement converting apparatus comprises:

a bell crank plate having a first end portion pivotally coupled to the printing apparatus for engaging the printing unit and having a second end portion for engaging a stop member; and,

a stop member coupled to the inking or coating apparatus for engaging the second end portion of the bell crank plate.

7. The invention as set forth in claim 1, the printing apparatus comprising:

the movable frame having first and second side support members;

the ink or coating applicator rollers being mounted between the first side support member and second side support member and having a reservoir or fountain pan for receiving ink or coating material;

cradle means mounted on the first and second side support members, respectively for removably supporting the first and second applicator rollers in the movable frame;

power transfer means coupled to the applicator rollers for rotation thereof.

8. The invention as set forth in claim 7,

the cradle means including a first cradle assembly disposed on the first and second side support members, respectively, and a second cradle assembly disposed on the first and second side support members, respectively;

the first applicator roller is mounted for rotation on the first cradle assembly; and

the second applicator roller is mounted for rotation on the second cradle assembly.

9. The invention as set forth in claim 1 wherein a container means for containing liquid ink or coating material and means for applying ink or coating material from the container means to a peripheral surface portion of the first and second applicator rolls is provided and supported by the printing apparatus.

10. The invention as set forth in claim 9 wherein the container means comprises a doctor blade assembly having a reservoir or fountain pan for supplying ink or coating material to each of said applicator rollers, and having a doctor blade disposed for wiping engagement with each of said applicator rollers when it is received in rolling contact with ink or coating material in the reservoir or pan.

11. The invention as set forth in claim 9, wherein the container means comprises a fountain pan and the inking applying means comprises a pan for transferring ink or coating material from the fountain pan to said first and second applicator rollers.

12. A rotary offset printing press having a printing unit of the type having a delivery side and a dampener side, said dampener side having a dampener space for receiving a dampener, comprising, in combination:

a plate cylinder mounted on the printing unit between the delivery side and the dampener side, and a printing plate mounted on the plate cylinder;

a blanket cylinder having an ink or coating receptive blanket disposed in ink or coating transfer engagement with the plate for transferring ink or coating material from the image surface areas of the printing plate to the ink or coating receptive blanket;

an impression cylinder disposed adjacent the blanket cylinder thereby forming a nip between the blanket and the impression cylinder whereby the printing ink or coating material is transferred from the blanket to a substrate as the substrate is transferred through the nip;

support means mounted on the dampener side of the printing unit;

an inking or coating apparatus having a removable first applicator roller and a removable second applicator roller, being positioned in the dampener space in place of a dampener, the inking or coating apparatus being coupled to the support means for movement between an on-impression operative position and an off-impression retracted position wherein the first applicator roller is adjustably supported for movement into and out of ink or coating association with the plate on the plate cylinder while the second applicator roller is adjustably supported for simultaneous movement into and out of ink or coating association with the blanket on the blanket cylinder; and

whereby a continuous or spot film of ink or coating can be applied by the inking and coating apparatus to a plate on the plate cylinder and a blanket on the blanket cylinder and ink or coating can be selectively applied to the plate on the plate cylinder or the blanket cylinder blanket or a plate thereon.

13. The invention as defined in claim 12 wherein the plate cylinder, blanket cylinder, impression cylinder and inking or coating apparatus forms a first printing unit, the printing press having a second printing unit for printing or coating the substrate subsequently to the first printing unit, the printing press further including:

a dryer mounted on the printing press for discharging heated air onto a freshly printed or coated substrate from the first printing unit before the freshly printed or coated substrate is subsequently printed, coated or otherwise processed in the second printing unit.

14. The invention as defined in claim **13** wherein:

the dryer is mounted adjacent to the impression cylinder for discharging heated air onto a freshly printed or coated substrate while the substrate is in contact with the impression cylinder.

15. The invention as defined in claim **13** comprising:

an extractor coupled to the dryer for extracting hot air, moisture, odors and volatiles from an exposure zone between the dryer and the freshly printed or coated substrate.

16. The invention as defined in claim **12** wherein the printing press has an interunit position, comprising:

a transfer cylinder disposed in the interunit position on the press and coupled in sheet transfer relation with the impression cylinder; and

an interunit dryer disposed adjacent the transfer cylinder for discharging heated air onto a freshly printed or coated substrate after it has been transferred from the impression cylinder and while it is in contact with the transfer cylinder.

17. A printing press as defined in claim **12** wherein the plate cylinder, blanket cylinder, impression cylinder, support means and inking or coating apparatus form a first printing unit, the printing press having a second printing unit including a plate cylinder, a blanket cylinder and an impression cylinder in operable combination, further including:

a transfer drum coupled in substrate transfer relation with the impression cylinder of the first printing unit and in substrate transfer relation with the impression cylinder of the second printing unit;

a first dryer mounted adjacent the impression cylinder of the first printing unit for discharging heated air onto a freshly printed or coated substrate while the substrate is in contact with the impression cylinder of the first printing unit;

a second dryer mounted adjacent the transfer drum for discharging heated air onto a freshly printed or coated substrate after it has been transferred from the impression cylinder of the first printing unit and while it is in contact with the transfer cylinder; and,

a third dryer disposed adjacent the impression cylinder of the second printing unit for discharging heated air onto a freshly printed or coated substrate after it has been transferred from the transfer drum and while it is in contact with the impression cylinder of the second printing unit.

18. The invention as defined in claim **12** wherein the inking or coating apparatus includes:

first cradle means for supporting the first applicator roller for engagement with the plate when the inking or coating apparatus is in the operative position; and,

second cradle means for supporting the second applicator roller for engagement with the blanket when the inking or coating apparatus is in the operative position.

19. The invention as defined in claim **12**, said support means comprising:

first and second pivot means mounted on the first and second side frame members, respectively.

20. The invention as defined in claim **12**, further comprising:

a power actuator pivotally coupled to the inking or coating apparatus, the power actuator having a power transfer arm which is selectively extendable or retractable; and,

apparatus coupled to the power transfer arm and to the inking or coating apparatus for converting extension or retraction movement of the power transfer arm into pivotal movement of the inking or coating apparatus relative to the printing unit.

21. The invention as defined in claim **12** further comprising:

a bell crank plate having a first end portion coupled to the inking or coating apparatus and having a second end portion for engaging a stop member; and,

a stop member secured to the inking or coating apparatus for engaging the second end portion of the bell crank plate.

22. The invention as defined in claim **1** or **12** wherein the inking or coating apparatus comprises:

the first applicator roller having a resilient transfer surface.

23. A printing press as defined in any one of claims **1** or **12** including:

a supply container for containing a volume of liquid ink or coating material;

circulation means coupled between the supply container and the inking or coating apparatus for inducing the flow of liquid ink or coating material from said supply container to the inking or coating apparatus and for returning liquid ink or coating material from the inking or coating apparatus to the supply container; and,

heat exchanger means coupled to the circulation means for maintaining the temperature of the liquid ink or coating material within a predetermined temperature range.

24. A printing press as defined in any one of the claims **1** or **12** wherein the inking or coating apparatus comprises:

a fountain pan for containing a volume of liquid ink or coating material;

an applicator roller having a metering surface; and,

a pan roller mounted for rotation in the fountain pan and coupled to the applicator roller for transferring ink or coating material from the fountain pan to the applicator roller.

25. A printing press as defined in any one of claims **1** or **12** characterized in that:

a resilient packing is mounted on the blanket cylinder, and a printing plate is mounted on the resilient packing.

26. A printing press as defined in any one of claims **1** or **12** further including means for applying ink or coating material to the first and second applicator rollers, and the inking or coating apparatus is pivotally mounted on the printing unit in a position in which the nip contact point between the applicator rollers and the blanket and plate cylinders is offset with respect to a radius line projecting through the center of the plate cylinder and blanket cylinder to the axis of pivotal motion of the inking or coating apparatus.

* * * * *

EXHIBIT C

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"RETRACTABLE INKING/COATING APPARATUS HAVING FERRIS MOVEMENT BETWEEN PRINTING UNITS"

<u>Abstract of the Disclosure</u>

A retractable in-line inking/coating apparatus selectively applies either spot or overall ink/coating to a blanket or flexographic plate on a blanket cylinder or spot coating or overall ink/coating to a flexographic printing plate on a plate cylinder in a rotary offset printing press. The inking/coating apparatus is pivotally mounted on the tower of a printing unit or dedicated coating unit, and is extended into and retracted out of inking/coating engagement by a carriage assembly which is pivotally coupled to the printing unit tower. Because of the pivotal support provided by a cantilevered support arm, the inking/coating apparatus can be raised and lowered through a Ferris wheel arc movement between adjacent printing units. The aqueous component of the printing ink or coating is evaporated by a high velocity, hot air interstation dryer and a high performance heat and moisture extractor so that the ink on a freshly printed sheet is dry before the sheet is printed on the next printing unit. Thus, flexographic ink or coating applied at the first printing unit can immediately be overprinted on subsequent printing units.

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TITLE: "RETRACTABLE INKING/COATING APPARATUS HAVING FERRIS MOVEMENT BETWEEN PRINTING UNITS"

Field of the Invention

This invention relates to sheet-fed or web-fed, rotary offset or flexographic printing presses, and more particularly, to a new and improved inking/coating apparatus for the in-line application of printing inks or protective or decorative coatings to sheets or web.

Background of the Invention

Conventional sheet-fed, rotary offset printing presses typically include one or more printing units through which individual sheets are fed and printed with wet ink. After the last printing unit, the sheets are transferred by a delivery conveyor to the delivery end of the press where the freshly printed sheets are collected and stacked. In a typical sheet-fed, rotary offset printing press such as the Heidelberg Speedmaster line of presses, the delivery conveyor includes a pair of endless gripper chains carrying gripper bars and gripper fingers which grip and pull freshly printed sheets from the last impression cylinder and convey the sheets to the sheet delivery stacker.

Since the inks used with rotary offset printing presses typically remain wet and tacky for some time after printing, special precautions must be taken to insure that the freshly printed sheets are not marked or smeared as the sheets are transferred from one printing unit to another, and while being conveyed to the sheet delivery stacker. The printed surface of the sheet dries relatively slowly and can be smeared during subsequent transfer between printing units. In order to reduce smearing and offsetting, spray powder is applied on the printed sheet.

In some printing applications, offset and smearing are prevented by applying a protective and/or decorative coating over all or a portion of the freshly printed sheets. Some coating solutions include varnish, lacquer, dye, moisturizers and ink. Such coatings are formed of a UV-curable or water-dispersed resin applied as a liquid solution or emulsion over the freshly printed sheets to protect the ink and improve the appearance of the freshly printed sheets. Such coatings are particularly desirable when decorative or protective finishes are required such as in the production of posters, record jackets, brochures, magazines, folding cartons and the like. The coating is permeable to oxygen to permit drying of the ink. In cases where a liquid coating is to be applied, the coating operation is carried out after the last color ink has been printed. In some cases, it is desirable to spot coat from the printing plate. For both operations, the coating is most desirably performed by an in-line coater.

In printing presses having flexographic printing plates, an aqueous ink is used, for example metallic (gold) ink and opaque white ink, both of which can be overprinted at the next printing unit. An advantage of flexographic printing is that no dampening unit is required. The flexographic printing plate has a raised image surface (relief). Colors are stronger when flexographic inks are used because they are not diluted by dampening solution.

Description of the Prior Art

Various arrangements have been made for applying the coating as an in-line printing operation by using the last printing unit of the press as the coating application unit. For example, in U.S. Patents 4,270,483, 4,685,414 and 4,779,557, there are disclosed coating apparatus which can be moved into position to allow the blanket cylinder of the last printing unit of a press to be used to apply a coating material to the sheets. In U.S. Patent 4,796,536 and U.S. Patent 4,841,903 there is disclosed a coating apparatus which can be selectively moved between the blanket cylinder or the plate cylinder of the last printing unit of the press so that the last printing unit can only be used for coating purposes. However, when coating apparatus of these types are used, the last printing unit cannot be used to apply ink to the sheets, but rather can only be used for the coating operation. Thus, while coating with these types of in-line coating apparatus, the press loses the capability of printing its full range of colors since the last printing unit is converted to a coating unit.

Proposals for overcoming the problem of the loss of a printing unit when in-line coating is desired have also been made, such as that set forth in U.S. Patent 4,934,305 which discloses a coating apparatus having a separately timed applicator roller positioned to apply the coating material to the freshly printed sheet while the sheet is on the last impression cylinder of the press. This is said to allow the last printing unit to print and coat simultaneously, so that no loss of a printing unit capability results. Another approach to providing a coating unit without losing the printing capabilities of the last printing unit is to provide a totally separate coating unit downstream of the last printing unit so that the coating is applied to the sheets after the last printing unit. Such an arrangement is disclosed in U.S. Patents 4,399,767, 4,706,601 and 5,176,077.

In an effort to reduce costs and maintain flexibility in adapting the printing press to different jobs, coating apparatus

has been provided that can be selectively engaged with the plate cylinder or blanket cylinder to carry out the coating operation and disengaged so that the last printing unit can be used for offset printing when coating is not required. Examples of coaters which are selectively engagable with either the plate cylinder or the blanket cylinder are disclosed in U.S. Patent 4,615,293 (Jahn), U.S. Patent 5,107,790 (Sliker et al.) and U.S. Patent 4,841,903 (Bird).

The coater of U.S. Patent 4,615,293 includes two applicator rollers, both disposed on the dampening side of the plate cylinder and blanket cylinder for carrying out spot and blanket coating operations as desired. The coater of U.S. Patent 5,107,790 is retractable along an inclined rail for extending and retracting a coater head into engagement with either the plate cylinder or the blanket cylinder. Because of its size, the rail-retractable coater can only be installed between the last printing unit of the press and the delivery stacker, and cannot be used at interstation positions. The coaters of Patent 4,615,293 are located on the dampener side of the plate and blanket cylinders, thus requiring removal of the dampening unit to make room for the doctor blade head and applicator rollers. Consequently, the last printing unit of the press is converted into a coating unit, resulting in the loss of the printing capability of that printing unit.

It will be appreciated that the time required to reconfigure a press for coating or non-coating is non-productive and costly. Accordingly, there is a need for a coating apparatus which minimizes the time to clean-up from one printing run and set up and run the next job. Where consecutive jobs require the same type of coating, particularly blanket coating, it may not be necessary to clean-up the coater between jobs. However, the coating cannot be allowed to dry on the rollers. Therefore especially when switching from blanket to spot coating or vice versa, or if there is a delay between jobs, it is necessary to wash-up the coater after each job is completed.

In addition, wash-up is necessary when switching between different coating compositions, such as aqueous and ultra-violet (UV) curable coatings. Such coatings are not interchangeable, and the coaters must be washed between applications of the different coating media. It is difficult to wash-up some coaters while the press is running. Moreover, the retractable coaters mentioned above occupy a large amount of press space and diminishes accessibility to the press. Elaborate equipment is needed for retracting the coater from the operative coating position to an out-of-the-way, inoperative position which reduces access to the printing unit.

A limitation on the use of flexographic printing plates and aqueous printing inks is that the freshly printed or coated sheets require hot air for drying. When applying an aqueous ink such as opaque white or metallic gold, it is necessary to dry the printed sheets between printing units before overprinting them.

Moreover, when utilizing lithographic printing inks, it is necessary to frequently stop the press and wash the blanket. Metallic ink in particular "piles" on the blanket and must be washed frequently.

Objects of the Invention

Accordingly, the principal object of the present invention is to provide improved inking/coating apparatus which is capable of selectively applying ink or a coating material to a plate on a plate cylinder or a coating material to a blanket on a blanket cylinder of a printing press.

Another object of the present invention is to provide inking/coating apparatus of the character described which is extendable into inking/coating engagement with either a plate cylinder or a blanket cylinder, and which is retractable to a non-operative position to provide clear access to the cylinders of the printing unit.

A related object of the present invention is to provide inking/coating apparatus of the character described which is

capable of being used in an interstation position and does not interfere with access to the press.

Yet another object of the present invention is to provide inking/coating apparatus of the character described, which can be moved from an operative inking/coating engagement position to a non-operative, retracted position.

Still another object of the present invention is to provide inking/coating apparatus of the character described, which can be used for applying aqueous inks and coatings to a lithographic printing plate or a flexographic printing plate in a rotary offset press.

A related object of the present invention is to provide inking/coating apparatus of the character described, which is capable of applying aqueous coating at one printing unit and drying the coating before it reaches the next printing unit where it can be overprinted with aqueous ink or lithographic ink.

Another object of the present invention is to provide inking/coating apparatus for use on a multiple color rotary offset printing press that can apply ink or coating to the plate or blanket of a printing unit from a single applicator head.

A related object of the invention is to provide inking/coating apparatus of the character described, in which no printing unit adjustment or alteration is required when the applicator head is converted from plate to blanket operation and vice versa.

Summary of the Invention

The foregoing objects are achieved by a retractable, in-line inking/coating apparatus which is mounted on a printing unit tower for pivotal, Ferris wheel type movement between an operative inking/coating position and a retracted, overhead position. The inking/coating apparatus includes an applicator head which extends into and retracts out of engagement with a plate on a plate cylinder or a blanket on a blanket cylinder. The inking/coating applicator head is positioned in parallel alignment with either

the plate cylinder or the blanket cylinder by a carriage assembly which includes a cantilever support arm. The support arm is pivotally coupled between the inking/coating head and the printing unit tower. This cantilevered, pivotal mounting arrangement allows the inking/coating unit to be used between two printing units, as well as installed on the last printing unit of the press.

In the preferred embodiment, the applicator head includes vertically spaced pairs of cradle members with one cradle pair being adapted for supporting a metal or ceramic coating roller in alignment with a blanket cylinder, and the other cradle pair supporting a resilient anilox coating roller in alignment with the plate cylinder, respectively, when the applicator head is in the operative position. Because of the cantilevered, pivotal support provided by the support arm, the applicator head can be lifted and lowered through an arc, similar to Ferris wheel movement, in the limited space between adjacent printing units. When fully retracted, the coater and carriage assembly are lifted to an overhead position overlying the printing unit tower, thus providing complete access to the printing unit cylinders, without causing the printing unit to lose its printing capability. The inking/coating applicator roller can be inspected, cleaned or replaced and the doctor blade assembly can be washed-up automatically while the inking/coating apparatus is in the fully retracted position.

When the inking/coating apparatus is used in combination with a flexographic printing plate and aqueous ink or aqueous coating, the water component of the aqueous ink or coating on the freshly printed sheet is evaporated by a high velocity, hot air interstation dryer and a high volume heat and moisture extractor assembly so that the freshly printed ink or coating is completely dry before the sheet is printed on the next printing unit. This quick drying flexographic printing/coating arrangement permits a base coat of ink, for example opaque white or metallic ink (gold, silver or other metallics) to be applied in the first printing

unit, and then overprinted by the lithographic process on the next printing unit.

Other features and advantages of the present invention will become more apparent from the following detailed description taken in conjunction with the accompanying drawings which disclose, by way of example, the principles of the present invention.

Brief Description of the Drawings

FIGURE 1 is a schematic side elevational view of a sheet-fed, rotary offset printing press having inking/coating apparatus embodying the present invention;

FIGURE 2 is a perspective view of the printing press of FIGURE 1 in which a dual head inking/coating apparatus is in the operative coating position and a single head coater is in a retracted, overhead position;

FIGURE 3 is an enlarged simplified perspective view showing one side of the single head inking/coating apparatus of FIGURE 1 in the operative position;

FIGURE 4 is a simplified side elevational view showing the dual head inking/coating apparatus in the operative coating position for spot or overall coating from the blanket position;

FIGURE 5 is a simplified side elevational view showing the single head inking/coating apparatus in the operative coating position for spot or overall coating from the plate position; and,

FIGURE 6 is a simplified side elevational view of the dual head inking/coating apparatus of FIGURE 4, partially broken away, which illustrates the hydraulic drive assembly and doctor blade assembly.

Detailed Description of the Preferred Embodiments

As used herein, the term "processed" refers to various printing methods which may be applied to either side of a substrate, including the application of UV-curable and aqueous inks and/or coatings. The term "substrate" refers to sheet or web

material. Also, as used herein, the term "waterless printin plate" refers to a printing plate having non-image surface area which are hydrophobic and also having image surface areas whic are hydrophilic, wherein the non-image surface areas are charac terized by a surface tension value which is less than the surfac tension of aqueous ink, and the image surface areas are character ized by a surface tension value which is greater than the surfac tension of aqueous ink. "Flexographic" refers to flexibl printing plates having a relief surface which is wettable b aqueous ink or coating material.

As shown in the exemplary drawings, the presen invention is embodied in a new and improved in-line inking/coatin apparatus, herein generally designated 10, for use in applyin inks or protective and/or decorative coatings to sheets or web printed in a sheet-fed or web-fed, offset rotary or flexographi printing press, herein generally designated 12. In this instance as shown in FIGURE 1, the inking/coating apparatus 10 is installe in a four color printing press 12, such as that manufactured b Heidelberger Druckmaschinen AG of the Federal Republic of Germany under its designation Heidelberg Speedmaster 102V (40"). The press 12 includes a press frame 14 coupled at one end, herein the right end, to a sheet feeder 16 from which sheets, herein designated S, are individually and sequentially fed into the press, and at the opposite end, with a sheet delivery stacker 20 in which the freshly printed sheets are collected and stacked. Interposed between the sheet feeder 16 and the sheet deliver stacker 20 are four substantially identical sheet printing unit 22, 24, 26 and 28 which can print different color inks onto th sheets as they are transferred through the press 12. The printin units are housed within printing towers T1, T2, T3 and T4 forme by side frame members 14, 15.

As illustrated, the printing units 22, 24, 26 and 28 ar substantially identical and of conventional design. The firs printing unit 22 includes an in-feed transfer cylinder 30, a plat cylinder 32, a blanker cylinder 34 and an impression cylinder 3

all supported for rotation in parallel alignment between the press side frames 14, 15 which define printing unit towers T1, T2, T3 and T4. Each of the first three printing units 22, 24 and 26 have a transfer cylinder 38 disposed to withdraw the freshly printed sheets from the adjacent impression cylinder and transfer the freshly printed sheets to the next printing unit via an inter-station transfer cylinder 40. The last printing unit 28 is shown equipped with a delivery cylinder 42 which supports the printed sheet 18 as it is transferred from the last impression cylinder 36 to a delivery conveyor system, generally designated 44, to the sheet delivery stacker 20.

The delivery conveyor system 44 as shown in FIGURE 2 is of conventional design and includes a pair of endless delivery gripper chains 46, only one of which is shown carrying at regular spaced locations along the chains, laterally disposed gripper bars having gripper fingers used to grip the leading edge of a freshly printed sheet 18 after it leaves the nip between the delivery cylinder 42 and impression cylinder 36 of the last printing unit 28. As the leading edge is gripped by the grippers, the delivery chains 46 pull the sheet away from the impression cylinder 36 and convey the freshly printed sheet to the sheet delivery stacker 20.

Prior to reaching the delivery sheet stacker, the freshly printed and/or coated sheets S pass under a delivery dryer 48 which includes a combination of infra-red thermal radiation, high velocity hot air flow and a high performance heat and moisture extractor for drying the ink and/or the protective/decorative coating.

In the exemplary embodiment shown in FIGURE 1, the first printing unit 22 is equipped with a flexographic printing plate, and does not require an inking roller train or a dampening system. If an ink roller train is mounted on the first printing unit, the form rollers are retracted and locked off when the printing unit goes on impression. Flexographic aqueous ink is supplied by the inking/coating unit 110. The remaining printing units 24, 26 and 28 are equipped for lithographic printing and include an inking

apparatus 50 having an inking roller train 52 arranged to transfer ink from an ink fountain 54 to the plate cylinder 32. This is accomplished with the aid of a fountain roller 56 and a ductor roller. The fountain roller 56 projects into the ink fountain 54, whereupon its surface is wetted with ink. The printing ink Q is transferred intermittently to the inking roller train 52 by the ductor roller. The inking roller train 52 supplies ink Q to the image ares of a printing plate P mounted on the plate cylinder 32.

The printing ink Q is transferred from the printing plate P to an ink receptive blanket B which is mounted on the blanket cylinder 34. The inked image carried on the blanket B is transferred to a sheet S as the sheet is transferred through the nip between the impression cylinder 36 and the blanket B.

The inking roller arrangement 52 illustrated in FIGURE 1 is exemplary for use in combination with lithographic ink printing plates. It will be understood that dampening rollers (not illustrated) will be in direct engagement with the lithographic plate P, but are not used in combination with the flexographic plate of printing unit 22.

Referring now to FIGURE 4, FIGURE 5 and FIGURE 6, the in-line inking/coating apparatus 10 includes a carriage assembly 58 which supports an applicator head 60. The applicator head 60 includes a hydraulic motor 62, a lower gear train 64, an upper gear train 65, an applicator roller 66 and a doctor blade assembly 68. The external peripheral surface of the applicator roller 66 is inserted into wetting contact with liquid coating material or ink contained in a reservoir 70. The reservoir is continuously supplied with ink or coating which is circulated through the reservoir 70 from an off-press source by a pump (not illustrated). The hydraulic motor 62 drives the applicator roller 66 synchronously with the plate cylinder 32 and the blanket cylinder 34 in response to an RPM control signal from the press drive (not illustrated) and a feedback signal developed by a tachometer 72. While a hydraulic drive motor is preferred, an electric drive motor can be used.

The fluid metering applicator 66 is preferably an anilox roller which transfers measured amounts of printing ink or coating material onto the printing plate or blanket. The surface of an anilox roller is engraved with an array of closely spaced, shallow depressions referred as "cells". Ink or coating from the reservoir 70 flows into the cells as the anilox roller turns through the reservoir. The transfer surface of the anilox roller is scraped with a doctor blade 73 to remove excess ink or coating. The ink or coating remaining on the anilox roller is that contained within the cells.

The anilox roller 66 is cylindrical and may be constructed in various diameters and lengths, containing cells of various sizes and shapes. The volumetric capacity of an anilox roller is established during manufacturing and is dependent upon the selection of cell size, shape and number of cells per unit area. Depending upon the intended application, the cell pattern may be fine (many small cells per square inch) or coarse (fewer larger cells per square inch).

By applying the ink or coating through the inking/coating applicator 60, more ink or coating can be delivered to the sheet S as compared with the inking roller train of a lithographic printing unit. Moreover, color intensity is stronger and more brilliant because the flexographic ink is applied at a much larger film thickness than can be applied by the lithographic process and is not diluted by dampening solution.

Preferably, the doctor blade assembly 68 is constructed as described in U.S. Patent 5,176,077 (DeMoore), which is incorporated herein by reference.

The applicator head 60 includes side frame members 74, 76 which support the applicator roller 66, gear train 64, gear train 65, doctor blade assembly 68 and the drive motor 62. The applicator roller 66 is supported at opposite ends on a lower cradle formed by a pair of end plates 78, 80 which hold the applicator roller 66 in parallel alignment with the blanket cylinder 34 (FIGURE 5). The side frame 74, 76 are also provided

with an upper cradle formed by a pair of side plates 82, 84 which are vertically spaced with respect to the lower side plates 78, 80. Each cradle has a pair of sockets 79, 81 and 83, 85, respectively, for holding an applicator roller 66 for spot coating or inking engagement against the plate P of the plate cylinder 32 (FIGURE 4) or the blanket B of the blanket cylinder 34.

Preferably, the applicator roller 66 for the upper cradle (plate) position is an anilox roller having a resilient transfer surface. In the dual cradle arrangement, the press operator can quickly change over from blanket inking/coating and plate inking/coating with minimum press down time, since it is only necessary to remove and reposition or replace the applicator roller 66, and wash-up the doctor blade assembly if changing from ink to coating or vice versa. The capability to selectively operate in either the flexographic mode or the lithographic mode and to print or coat from either the plate or blanket position is referred to herein as the "LITHOFLEX" p

According to an important feature of the present invention, the applicator head 60 is supported by the carriage assembly 58 in a cantilevered, pivotal arrangement which allows the dual cradle inking/coating apparatus 10 and single cradle inking/coating apparatus 110 to be installed and used between any two adjacent printing units, as well as installed on the first and last printing units of the press. This is made possible by a pair of cantilevered support arms 88, 90 which are pivotally coupled to the side plates 74, 76, respectively, on a pivot shaft 77. Each support arm has a hub portion 88A, 90A, respectively and an elongated shank portion 88B, 90B, respectively. The elongated shank portion extends transversely with respect to the shank portion, and preferably extend perpendicularly with respect to each other.

The cantilevered support arms are pivotally mounted on the printing tower by pivot blocks 92, 94, respectively. The hub portions 88A, 90A are journalled for rotation on pivot shafts 96, 98, respectively. The pivot blocks 92, 94 are securely fastened

to the tower 14D, so that the carriage assembly 86 is pivotally suspended from the pivot shafts 96, 98 in a cantilevered Ferris support arrangement. The shank portions 88B, 90B are pivotally coupled to the pivot shaft 77, so that the carriage assembly 58 and the applicator head 60 are capable of independent rotation with respect to each nd with respect to the pivot shaft 77. By this arrangement, the applicator head 60 is pivotally suspended from the pivot shaft 77, and remains in an upright orientation as the support arms rotate from the operative position to the fully retracted position and vice versa.

Thus, the cradles 78, 80 and 82, 84 position the applicator roller 66 in vertical and horizontal alignment with the plate cylinder or blanket cylinder when the applicator head is extended to the operative position. Moreover, because of the transverse relationship between the hub portion and shank portion of the support arms, the applicator head 60 and carriage assembly 58 are capable of rotating through a Ferris arc without touching the adjacent tower. This makes it possible to install the inking/coating apparatus 10 on any intermediate printing unit tower (T2, T3), and as well as the first printing unit tower T1 and the last printing unit tower T4. Additionally, because of the transverse relationship of the support arm hub portion and shank portion, the lateral projection of the applicator head 60 into the interstation space between printing units is minimized, thus assuring virtually unrestricted operator access in the interstation space between adjacent printing units when the applicator head is engaged in the operative position, and completely unrestricted access when the applicator head is completely retracted.

As shown in FIGURE 1 and FIGURE 2, rotation of the carriage assembly 58 is counterclockwise from the retracted position (shown in phantom) to the operative position. The carriage assembly can be adapted for clockwise rotation from the retracted position to the operative position for engagement of the applicator roller to either the plate cylinder or the blanket

cylinder on the dampener side of the tower, assuming that access to the plate and blanket is not restricted by dampener rollers or the like.

Rotational movement of the support arms 88, 90 is assisted by counterweights 100, 102 which are secured to the support arms, respectively, for concurrent rotation with respect to the pivot blocks 92, 94. With the passive assistance of the counterweights, the press operator can easily move the inking/coating assembly 10 from the engaged operative position as shown in FIGURE 4 to the fully retracted idle position as shown in phantom in FIGURE 1. Preferably, rotation of the carriage assembly 58 is assisted by power means such as a torsion spring, electric motor, or hydraulic motor.

The inking/coating apparatus 10 is releasably locked into the engaged position as shown in FIGURE 4 by releasable latch couplings 103, 105 which secure the support arms 88, 90 to the press side frames 14, 15, respectively, of the printing unit tower T4 in the operative position. Coating engagement of the applicator roller 66 against the blanket cylinder 34 is produced by power actuators, preferably pneumatic cylinders 104, 106 which have extendable/retractable power transfer arms 104A, 106A, respectively. The pneumatic cylinder 104 is pivotally coupled to the support arm 88 by a pivot linkage 108, and the second pneumatic cylinder 106 is pivotally coupled to the support arm 90 by a pivot linkage 109. In response to actuation of the pneumatic cylinders 104, 106, the power transfer arms are retracted. As the arms retract, the inking/coating head 60 is rotated counterclockwise on the pivot shaft 77, thus moving the applicator roller 66 into coating engagement with the blanket cylinder 34.

The pivot linkage 108 includes a bell crank 111 which is mounted for pivotal movement on a pin 113. The pin 113 is supported by a clevis plate 115 which is attached to the support arm 88. One end of the bell crank is pivotally coupled to the actuator arm 104A, and a cam roller 117 is mounted for rotation on its opposite end.

The cam roller 117 is engagable against an adjustable stop 119 which is rigidly secured to the side plate 74. Counterclockwise shifting of the handle H moves a cam follower 121 into a latch pocket 123 of a receiver block 125 as the cam roller 117 is moved into engagement with the adjustable stop 119 in the interlocked, operative position. Referring to FIGURE 4, FIGURE 5 and FIGURE 6, the receiver block is rigidly secured to the delivery side face of the printing unit tower by machine screws.

When the plate P goes on impression, power is applied to the pneumatic actuator 104 and the power transfer arm 104A retracts, thus causing the bell crank 111 to rotate counterclockwise about the pin 113. The torque applied by the actuator is transmitted to the applicator head 60 through the cam roller 117 and the adjustable stop 119. Counterclockwise movement of the applicator head 60 relative to the support shaft 77 carries the applicator roller 66 into engagement with the plate P.

The adjustable stop 119 has a threaded bolt 119A which is engagable with the cam roller 117. The striking point of engagement is preset so that the applicator roller 66 is properly positioned for engagement with the plate P or blanket B when the applicator head 60 is interlocked with the press frame 14 and the printing unit goes on impression.

Referring to FIGURE 5, an inking/coating apparatus 110 having a single head is illustrated. The construction of this alternative embodiment is identical in all respects with the dual head arrangement, with the exception that only a single gear train and a single cradle for holding the applicator roller is provided. In both embodiments, the inking/coating head 60 remains upright as it swings through an arc, similar to the movement of a Ferris wheel. Because of the upright orientation of the inking/coating head 60 as it moves between the extended and retracted positions, the usual platform spacing between printing unit towers provides adequate clearance to permit extension and retraction of the carriage assembly 58 without interference with operator access to the printing units. This is a significant advantage in that it

permits the in-line inking/coating apparatus to operate effectively in the interstation space between any adjacent printing units, and without blocking or obstructing access to the cylinders of the printing units when the inking/coating apparatus is in the fully retracted position as indicated in FIGURE 1.

Moreover, when the in-line inking/coating apparatus is in the fully retracted position, the applicator roller 66 is conveniently positioned on the dampener side of the printing unit for inspection, clean-up or removal. Additionally, the doctor blade assembly is also conveniently positioned for inspection, removal, adjustment or clean-up. The doctor blade reservoir and coating circulation lines can also be cleaned while the printing unit is running as well as when the press has been stopped for change-over from one type of ink or coating to another.

When the inking/coating apparatus is used for applying an aqueous ink or an aqueous coating material, the water component on the freshly printed sheet S is evaporated by a high velocity, hot air interstation dryer and high volume heat and moisture extractor units 112 and 114, as shown in FIGURE 1, FIGURE 4 and FIGURE 5. The dryer/extractor units 112 and 114 are oriented to direct high velocity heated air onto the freshly printed/coated sheet as it is transferred by the impression cylinder 36 and the intermediate transfer cylinder 40. By this arrangement, the freshly printed aqueous ink or coating is completely dry before the sheet is overprinted in the next printing unit.

The high velocity, hot air dryer and high performance heat and moisture extractor units 112, 114 utilize high velocity air jets which scrub and break-up the moist air level which clings to the surface of each freshly printed sheet. Within each dryer, high velocity air is heated to a high temperature as it flows across a resistance heating element within an air delivery baffle tube. High velocity jets of hot air are discharged through multiple airflow apertures through an exposure zone Z (FIGURE 4 and FIGURE 5) onto the freshly printed/coated sheet S as it is transferred by the impression cylinder 36 and transfer cylinder

40, respectively. Each dryer assembly includes a pair of air delivery dryer heads which are arranged in spaced, side-by-side relation. The high velocity, hot air dryer and high performance heat and moisture extractor units 112, 114 are preferably constructed as disclosed in co-pending U.S. Patent Application Serial No. 08/132,584, filed October 6, 1993, entitled "High Velocity Hot Air Dryer", assigned to the assignee of the present invention and which is incorporated herein by reference.

The high velocity, hot moisture-laden air displaced from each printed sheet is extracted from the dryer exposure zone Z and completely exhausted from the printing unit by the high volume extractors. Each extractor head includes a manifold coupled to the dryer heads and draws the moisture, volatiles and high velocity hot air through a longitudinal gap between the dryer heads. According to this arrangement, each printed sheet is dried before it is run through the next printing unit.

The water-based inks used in flexographic printing dry at a relatively moderate drying temperature provided by the interstation high velocity hot air dryers/extractors 112, 114. Because each freshly printed sheet is dried between each printing unit, clarity and print quality are substantially improved since the aqueous ink is dried at each printing unit before it enters the next printing unit. Since the aqueous ink is dry before the sheet enters the next printing unit, back-trapping on the blanket of the next printing unit is completely eliminated. This interstation drying arrangement makes it possible to print aqueous inks such as metallic ink and opaque white ink at one printing unit, and then overprint at the next printing unit.

Moreover, this arrangement permits the first printing unit to be used as a coater in which an aqueous coating is applied to low grade paper such as recycled paper to trap and seal in lint, dust, spray powder and other debris and provide a smoother durable surface which is overprinted in the next printing unit. An UV-curable coating can be applied over the first down over-printed (aqueous) coating in the last printing unit. The firs

down layer seals the surface of the low grade, rough substrate and improves overprinted dot definition while preventing strike-through and show-through.

Preferably, the applicator roller 66 is either metal or ceramic when it is used for applying a coating material to the blanket B on the cylinder 34. When the applicator roller 66 is applied to the plate, it is preferably constructed as an anilox roller having a resilient transfer surface for engaging a flexographic printing plate. Suitable resilient roller surface materials include Buna N synthetic rubber and EPDM (terpolymer elastomer).

It will be appreciated that the inking/coating apparatus 10 is capable of applying a wide range of ink types, including fluorescent (Day Glo), pearlescent, metallics (gold, silver and other metallics), glitter, scratch and sniff (micro-encapsulated fragrance), scratch and reveal, luminous, pressure-sensitive adhesives and the like.

The press operator can eliminate the dampener roller assembly altogether, and the inking/coating apparatus 10 can selectively apply aqueous inks and coatings to a flexographic or waterless printing plate and the blanket. Moreover, overprinting of the aqueous inks and coatings can be carried out in the next printing unit since the aqueous inks and coatings are completely dried by the high velocity, hot air interstation dryer and high volume heat and moisture extractor assembly of the present invention.

The aqueous inks and coatings as used in the present invention contain colored pigments and/or soluble dyes, binders which fix the pigments onto the surface of the printed sheet and waxes, defoamers and thickeners. Aqueous printing inks predominantly contain water as a solvent, diluent and/or vehicle. The thickeners which are preferred include algonates, starch, cellulose and its derivatives, for example cellulose esters or cellulose ethers and the like. Coloring agents including organic as well as inorganic pigments may be derived from dyes which are

insoluble in water. Also, the printing ink may contain water and may be predominantly glycol or the like, with the pigment being bound by an appropriate resin. When metallic inks are printed, the cells of the anilox roller must be appropriately sized to prevent the metal particles from getting stuck within the cells. The cell size is critical, and for metallic gold ink, the anilox roller should have a screen line count in the range of 175-300 lines per inch.

The inking/coating apparatus 10 can also apply UV-curable inks and coatings. If UV-curable inks and coatings are utilized, ultra-violet dryers/extractors are installed adjacent the high velocity hot air dryer/extractor units 112, 114, respectively.

Moreover, by utilizing the coating apparatus on the first printing unit, a seal coating can be applied to trap lint, spray powder, dust and other debris, and cover defects on lower grade paper which will improve print quality, which can then be overprinted on the next in-line printing unit.

It will be appreciated that the "LITHOFLEX" system described herein makes it possible to selectively operate a printing unit in either the flexographic printing mode or the lithographic printing mode, while also providing the capability to print or coat from either the plate or blanket position. The dual cradle support arrangement of the present invention makes it possible to quickly change over from inking/coating at the blanket cylinder position to inking/coating at the plate cylinder position with minimum press down-time, since it is only necessary to remove and reposition or replace the applicator roller 66 while the printing/inking apparatus is in the retracted position.

Moreover, the press operator may elect to spot or overall coat with aqueous ink/coating from the plate for one job, and then spot and/or overall coat from the blanket during the next job. Since the doctor blade assembly can be flushed and washed-up quickly and the applicator roller can be changed out quickly, it is possible to spot coat or overall coat from the plate position

or the blanket position with aqueous inks or coatings during t first press run and then spot coat or overall coat with UV-curab inks or coatings from the plate position or from the blank position during the next press run. The inking/coating apparat is completely out of the way in the retracted position; cons quently, the doctor blade reservoir and supply lines may flushed and washed-up by automatic wash-up equipment while t printing unit is printing another job.

The positioning of the applicator head and rolle assembly relative to the plate and blanket is repeatable to a pre determined, preset impression position. Consequently, no printin unit adjustment or alteration is required, except for flushing th doctor blade assembly and cleaning or replacing the applicato roller to accommodate a different kind of ink or coating Although manual extension and retraction have been described i connection with the exemplary embodiment, extension to th operative position and retraction to a non-operative position ca be carried out automatically by hydraulic or electric moto servomechanisms.

The cantilevered, Ferris wheel support arrangement allows the inking/coating apparatus to operate effectively in the interstation space between any adjacent printing units, as well as on the first or last printing units of the press, without blocking or obstructing the interstation space or restricting operator access to the cylinders of any of the printing units.

Finally, because the inking/coating apparatus of the present invention is mounted on a printing unit tower and i extendable to the operative position without requiring adjustment or alteration of the printing unit cylinders, it can be used fo applying ink or coating to the blanket cylinder of a rotary offse web press, or to the blanket of a dedicated coating unit.

Although the present invention and its advantages hav been described in detail, it should be understood that variou changes, substitutions and alterations may be made herein withou

departing from the spirit and scope of the present invention as defined by the appended claims.

What is claimed is:

1. In a printing press of the type having side frame members forming a printing unit tower on which a plate cylinder and blanket cylinder are supported for rotation, the improvement comprising:

inking/coating apparatus for applying ink or coating material to a plate mounted on the plate cylinder or to a blanket mounted on the blanket cylinder when the inking/coating apparatus is in an operative position; and,

a carriage assembly including a support arm having a first end portion pivotally coupled to the printing unit tower and a second end portion pivotally coupled to the inking/coating apparatus, the carriage assembly being movable to an operative position in which the inking/coating apparatus is suspended laterally adjacent to the plate and blanket cylinders, and being movable to a retracted position in which the inking/coating apparatus is elevated with respect to the plate and blanket cylinders.

2. The invention as set forth in claim 1, wherein the inking/coating apparatus comprises:

a doctor blade assembly having a reservoir for receiving ink or liquid coating material;

an applicator roller coupled to the doctor blade assembly in fluid communication with the reservoir, the applicator roller being engagable with a printing plate on the plate cylinder or with a blanket on the blanket cylinder when the inking/coating apparatus is in the operative position.

3. The invention as set forth in claim 2, the applicator roller comprising:

an anilox roller having a resilient transfer surface.

4. The invention as set forth in claim 1, including counterweight coupled to the support arm.

5. The invention as set forth in claim 1, furthe comprising:

a power actuator pivotally coupled to the suppor arm, the power actuator having a power transfer arm which i extendable and retractable; and,

apparatus coupled to the power transfer arm fo converting extension or retraction movement of the powar transfe arm into pivotal movement of the inking/coating apparatus relativ to the support arm.

6. The invention as set forth in claim 5, in which th movement converting apparatus comprises:

a bell crank plate having a first end portion coupled to the power transfer arm and having a second end portion for engaging a stop member;

a stop member secured to the inking/coating apparatus; and,

a clevis plate secured to the support arm and pivotally coupled to the bell crank plate.

7. The invention as set forth in claim 1, the inking/coating apparatus comprising:

an applicator head having first and second side frame members pivotally coupled to the carriage assembly;

a doctor blade assembly mounted between the first and second side frame members, the doctor blade assembly including a reservoir for receiving ink or liquid coating material;

cradle means mounted on the first and second sid frame members, respectively;

an applicator roller mounted for rotation on th cradle means and coupled to the doctor blade assembly for rollin contact with ink or coating material in the reservoir, th

applicator roller being engagable with a printing plate on the plate cylinder or with a blanket on the blanket cylinder in the operative position; and,

motor means coupled to the applicator roller for rotating the applicator roller.

8. The invention as set forth in claim 7,

the cradle means including first and second sockets disposed on the first and second side frame members respectively; and,

the applicator roller being mounted for rotation on the first and second sockets.

9. The invention as set forth in claim 7,

the cradle means including first and second sockets disposed on the first and second side frame members, respectively, and third and fourth sockets disposed on the first and second side frame members, respectively;

the applicator roller being mountable for rotation on the first and second sockets for applying ink or coating material to the plate when the carriage assembly is in the operative position; and,

the applicator roller being mountable for rotation on the third and fourth sockets for applying ink or coating material to the blanket when the carriage assembly is in the operative position.

10. The invention as set forth in claim 1, comprising:

male and female latch coupling members mounted on the carriage assembly and on the printing unit tower, respectively, for releasably latching the carriage assembly in interlocking engagement with the printing unit tower in the operative position.

11. The invention as set forth in claim 1, wherein the support arm comprises an elongated shank portion and a hub portion

which extends transversely with respect to the shank portion, the elongated shank portion being pivotally coupled to the inking/coating apparatus and the hub portion being pivotally coupled to the printing unit tower.

12. A sheet-fed, rotary offset printing press comprising, in combination:

at least one printing unit or dedicated coating unit having side frame members forming a tower;

at least one cylinder mounted for rotation on the tower for printing ink or coating material onto sheets passing through the printing unit or dedicated coating unit;

inking/coating apparatus including a doctor blade assembly having a reservoir for holding ink or coating liquid, a rotatable applicator roller and means for applying ink or coating liquid from the reservoir onto a peripheral surface portion of the applicator roller; and,

support apparatus mounted on the printing unit tower for pivotal movement, said support apparatus being movably coupled to the inking/coating apparatus for supporting the inking/coating apparatus for movement to an operative position in which the applicator roller is engagable with a plate or a blanket on the cylinder, and for movement to a retracted position in which the inking/coating apparatus is supported at an elevated position above the cylinder.

13. A rotary offset printing press comprising, in combination:

a plate cylinder having a printing plate mounted thereon;

a blanket cylinder having an ink receptive blanket disposed in ink transfer engagement with the plate cylinder for transferring ink from the image surface areas of the printing plate to the ink receptive blanket;

an impression cylinder disposed adjacent the blanket cylinder thereby defining a nip between the impression cylinder and the blanket whereby the printing ink is transferred from the blanket to a substrate as the substrate is transferred through the nip;

inking/coating apparatus for applying ink or coating material to the plate or to the blanket;

support apparatus mounted on the printing press for pivotal movement, said support apparatus being movably coupled to the coating apparatus for supporting the inking/coating apparatus for movement to an operative position in which the inking/coating apparatus is engagable with the plate or the blanket, and for movement to a retracted position in which the inking/coating apparatus is supported at an elevated position above the press; and,

a dryer mounted on the press for discharging heated air on the freshly printed substrate.

14. A rotary offset printing press as defined in claim 13, wherein:

the dryer is mounted adjacent the impression cylinder for discharging heated air onto a freshly printed substrate while the substrate is in contact with the impression cylinder.

15. A rotary offset printing press as defined in claim 13, comprising:

an extractor coupled to the dryer for extracting hot air, moisture and volatiles from an exposure zone between the dryer and the freshly printed substrate.

16. A rotary offset printing press as defined in claim 13, comprising:

a transfer cylinder disposed in an interstation position on the press and coupled in sheet transfer relation with the impression cylinder; and,

an interstation dryer disposed adjacent the transfer cylinder for discharging heated air onto a freshly printed or coated substrate after it has been transferred from the impression cylinder and while it is in contact with the intermediate transfer cylinder.

17. In a printing press of the type having side frame members forming a tower on which a blanket cylinder is supported for rotation, the improvement comprising:

inking/coating apparatus for applying ink or coating material to a blanket mounted on the blanket cylinder when the inking/coating apparatus is in an operative position; and,

a carriage assembly movably coupled to the tower and to the inking/coating apparatus for producing Ferris wheel movement of the inking/coating apparatus to the operative position in which the inking/coating apparatus is suspended laterally adjacent to the blanket cylinder, and to a retracted position in which the inking/coating apparatus is elevated with respect to the blanket cylinder.

18. The invention as set forth in claim 17, wherein the tower includes a plate cylinder and a plate mounted on the plate cylinder, the inking/coating apparatus including:

first cradle means for supporting an applicator roller for engagement against the plate when the inking/coating apparatus is in the operative position; and,

second cradle means for supporting an applicator roller for engagement against the blanket when the inking/coating apparatus is in the operative position.

19. The invention as set forth in claim 17, comprising:

said carriage assembly including a support arm having a first end portion pivotally coupled to the tower and having a second end portion;

a common pivot shaft on which the support arm second end portion and the inking/coating apparatus are pivotally mounted; and,

male and female latch members coupled between the common pivot shaft and the tower, with one of the latch members being secured to the common pivot shaft and the other latch member being secured to the tower, the latch members being mateable in interlocking engagement when the inking/coating apparatus is in the operative position.

20. The invention as set forth in claim 17, further comprising:

a power actuator pivotally coupled to the support arm, the power actuator having a power transfer arm which is extendable and retractable; and,

apparatus coupled to the power transfer arm for converting extension or retraction movement of the power transfer arm into pivotal movement of the inking/coating apparatus relative to the common pivot shaft.

21. The invention as set forth in claim 20, in which the movement converting apparatus comprises:

a bell crank plate having a first end portion coupled to the power transfer arm and having a second end portion for engaging a stop member;

a stop member secured to the inking/coating apparatus; and,

a clevis plate secured to the support arm and pivotally coupled to the bell crank plate.

22. The invention as set forth in claim 1, wherein the inking/coating apparatus comprises:

an applicator roller having a resilient transfer surface.

23. The invention as set forth in claim 1, wherein the applicator roller is mounted for engagement to a plate in the plate cylinder position, the applicator roller comprising an anilox roller having a resilient transfer surface.

24. A method for rotary offset printing in a rotary offset press of the type including first and second printing units, and using aqueous or UV-curable printing ink or coating material in the operation of at least the first printing unit, comprising the following steps performed at each printing unit in succession:

spot or overall coating with aqueous ink/aqueous coating or UV-curable ink/UV-curable coating from the plate;

spot and/or overall coating the blanket with aqueous ink/aqueous coating or UV-curable ink or UV-curable coating from the blanket;

transferring the printing ink or coating from the printing plate to the blanket;

transferring the printed image from the blanket to a substrate as the substrate is transferred through the nip between an impression cylinder and the blanket; and,

drying the ink or coating on the freshly printed substrate before the substrate is processed in the second printing unit.

25. A method for rotary offset printing as defined in claim 24,

wherein the drying step is performed by discharging hot air onto the freshly printed/coated substrate after it has been transferred from the first printing unit and while it is

contact with an intermediate transfer cylinder, but before it is processed in the second printing unit.

26. A method for rotary offset printing as defined in claim 24,

wherein the drying step is performed by directing high velocity, heated air onto the freshly printed/coated substrate while the freshly printed/coated substrate is in contact with an impression cylinder.

27. A method for rotary offset printing as defined in claim 24, including the steps:

transferring the freshly printed substrate to an intermediate transfer cylinder; and,

drying the freshly printed substrate while it is in contact with the intermediate transfer cylinder.

28. A method for rotary offset printing as defined in claim 24, including the step:

extracting hot air, moisture and volatiles from an exposure zone above the freshly printed/coated substrate while the freshly printed/coated substrate is in contact with the impression cylinder.

29. A method for rotary offset printing as defined in claim 24, including the steps:

applying a primer coating of an aqueous coating material or UV-curable coating material to a substrate in the first printing unit;

trapping and sealing dust, lint, spray powder and other debris under the primer coating; and,

drying the primer coating on the substrate before the substrate is overprinted in the second printing unit.

30. A method for rotary offset printing in a rotary offset press of the type including first and second printing units, and using aqueous or UV-curable printing ink/coating material in the operation of at least the first printing unit comprising the following steps performed at each printing unit in succession:

transferring the printing ink/coating material to a printing plate at the first printing unit;

transferring the printing ink/coating material from the printing plate to a blanket;

transferring the printed image from the blanket to a substrate as the substrate is transferred through the nip between an impression cylinder and the blanket; and,

drying the printing ink on the freshly printed substrate before the substrate is processed in the second printing unit.

31. A method for rotary offset printing as defined in claim 30,

wherein the drying step is performed by discharging hot air onto the freshly printed substrate after it has been transferred from the first printing unit and while it is in contact with an intermediate transfer cylinder, but before it is processed in the second printing unit.

32. A method for rotary offset printing as defined in claim 30, wherein the drying step is performed by directing high velocity, heated air onto the freshly printed substrate while the freshly printed substrate is in contact with the impression cylinder.

33. A method for rotary offset printing as defined in claim 30, including the steps:

transferring the freshly printed substrate to an intermediate transfer cylinder; and,

drying the freshly printed substrate while it is in contact with the intermediate transfer cylinder.

34. A method for rotary offset printing as defined in claim 30, including the step:

extracting hot air, moisture and volatiles from an exposure zone above the substrate while the substrate is in contact with the impression cylinder.

PATENT

JOINT
UTILITY

Attorney Docket
No. B6012

DECLARATION AND POWER OF ATTORNEY

We, RONALD M. RENDLEMAN, HOWARD W. DEMOORE, JOHN W. BIRD, joint inventors herein, hereby declare that:

Our residence, post office address and citizenship are as stated below next to our names.

We believe that we are the original, first and joint inventors of the subject matter which is claimed and for which a patent is sought on the invention entitled

"RETRACTABLE INKING/COATING APPARATUS HAVING FERRIS MOVEMENT BETWEEN PRINTING UNITS",

the specification of which is attached hereto.

We hereby state that we have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to in this declaration.

We each individually acknowledge the duty to disclose to the U.S. Patent Office all information known to me that is material to the patentability of any claim in accordance with Title 37, Code of Federal Regulations, §1.56, and which is material to the examination of this application, namely, information where there is a substantial likelihood that a reasonable examiner would consider it important in deciding whether to allow the application to issue as a patent.

We hereby claim foreign priority benefits under Title 35, United States Code §119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

Country	Application No.	Filing Date (day, month, year)

- NONE -

We hereby claim the benefit under Title 35, United

States Code §120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code §112, we acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations §1.56(a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

U.S. Serial No.	U.S. Filing Date	Status
- NONE -		

We hereby appoint DENNIS T. GRIGGS, Registration No. 27,790, of the firm of AKIN, GUMP, STRAUSS, HAUER & FELD, L.L.P., our attorney to prosecute this application and to transact all business in the U.S. Patent and Trademark Office connected therewith. We request that all correspondence be addressed to:

Dennis T. Griggs
Akin, Gump, Strauss, Hauer & Feld, L.L.P.
1700 Pacific Avenue, Suite 4100
Dallas, Texas 75201-4618

Phone: 214/969-2747

We hereby declare that all statements made herein of our own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of this application or any patent issued thereon.

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Date: May 1, 1995

John W. Bird
John W. Bird

Attorney Docket No.
B6012

SMALL ENTITY
INDEPENDENT INVENTOR

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

DECLARATION CLAIMING SMALL ENTITY STATUS (37 C.F.R. §1.9(f) and §1.27 (b)) - INDEPENDENT INVENTOR

I, RONALD M. RENDLEMAN, hereby declare that I qualify as an independent inventor as defined in 37 C.F.R. §1.9(c) for the purposes of paying reduced fees under Section 41(a) and (b) of Title 35, United States Code, to the U.S. Patent and Trademark Office with regard to the invention entitled

"RETRACTABLE INKING/COATING APPARATUS HAVING FERRIS MOVEMENT BETWEEN PRINTING UNITS"

__X__ in the application filed herewith.

____ in U.S. application Serial No. _____ filed _____.

____ patent No. _____, issued _____.

I have not assigned, granted, conveyed or licensed, and am under no obligation under contract or law to assign, grant, convey or license, any rights in the invention to any person who could not be classified as an independent inventor under 37 C.F.R. §1.9(c) if that person had made the invention, or to any concern which would not qualify as a small business concern under 37 C.F.R. §1.9(d) or a non-profit organization under 37 C.F.R. §1.9(e).

Each person, concern or organization to which I have assigned, granted, conveyed, or licensed or am under any obligation under contract or law to assign, grant, convey, or license any rights in the invention is identified below:

____ no such person, concern or organization exists.

__X__ any such person, concern or organization is identified below, if applicable:

Full Name Howard W. DeMoore

Address 10954 Shady Trail

Dallas, Texas 75220

__X__ individual ____ small business concern

____ nonprofit organization

I acknowledge the duty to file, in this application or patent, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small entity is no longer appropriate pursuant to 37 C.F.R. §1.28(b).

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application, any patent issuing thereon, or any patent to which this verified statement is directed.

Printed Name of Inventor: Ronald M. Rendleman

Date: 5/1/95

Signature of Inventor

Attorney Docket No.
B6012

SMALL ENTITY
INDEPENDENT INVENTOR

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

DECLARATION CLAIMING SMALL ENTITY STATUS
(37 C.F.R. §1.9(f) and §1.27 (b)) - INDEPENDENT INVENTOR

I, HOWARD W. DEMOORE, hereby declare that I qualify as an independent inventor as defined in 37 C.F.R. §1.9(c) for the purposes of paying reduced fees under Section 41(a) and (b) of Title 35, United States Code, to the U.S. Patent and Trademark Office with regard to the invention entitled

"RETRACTABLE INKING/COATING APPARATUS HAVING FERRIS MOVEMENT BETWEEN PRINTING UNITS"

__X__ in the application filed herewith.

____ in U.S. application Serial No. _____ filed _____.

____ patent No. _____, issued _____.

I have not assigned, granted, conveyed or licensed, and am under no obligation under contract or law to assign, grant, convey or license, any rights in the invention to any person who could not be classified as an independent inventor under 37 C.F.R. §1.9(c) if that person had made the invention, or to any concern which would not qualify as a small business concern under 37 C.F.R. §1.9(d) or a non-profit organization under 37 C.F.R. §1.9(e).

Each person, concern or organization to which I have assigned, granted, conveyed, or licensed or am under any obligation under contract or law to assign, grant, convey, or license any rights in the invention is identified below:

____ no such person, concern or organization exists.

__X__ any such person, concern or organization is identified below, if applicable:

Full Name Printing Research, Inc.

Address 10954 Shady Trail

Dallas, Texas 75220

____ individual _X_ small business concern

____ nonprofit organization

I acknowledge the duty to file, in this application or patent, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small entity is no longer appropriate pursuant to 37 C.F.R. §1.28(b).

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application, any patent issuing thereon, or any patent to which this verified statement is directed.

Printed Name of Inventor: Howard W. DeMoore

Date: May 1, 1990 Howard W. DeMoore
Signature of Inventor

Attorney Docket No.
B6012

SMALL ENTITY
INDEPENDENT INVENTOR

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

DECLARATION CLAIMING SMALL ENTITY STATUS (37 C.F.R. §1.9(f) and §1.27 (b)) - INDEPENDENT INVENTOR

I, JOHN W. BIRD, hereby declare that I qualify as an independent inventor as defined in 37 C.F.R. §1.9(c) for the purposes of paying reduced fees under Section 41(a) and (b) of Title 35, United States Code, to the U.S. Patent and Trademark Office with regard to the invention entitled

"RETRACTABLE INKING/COATING APPARATUS HAVING FERRIS MOVEMENT BETWEEN PRINTING UNITS"

__X__ in the application filed herewith.

____ in U.S. application Serial No. _____ filed _____.

____ patent No. _____, issued _____.

I have not assigned, granted, conveyed or licensed, and am under no obligation under contract or law to assign, grant, convey or license, any rights in the invention to any person who could not be classified as an independent inventor under 37 C.F.R. §1.9(c) if that person had made the invention, or to any concern which would not qualify as a small business concern under 37 C.F.R. §1.9(d) or a non-profit organization under 37 C.F.R. §1.9(e).

Each person, concern or organization to which I have assigned, granted, conveyed, or licensed or am under any obligation under contract or law to assign, grant, convey, or license any rights in the invention is identified below:

____ no such person, concern or organization exists.

__X__ any such person, concern or organization is identified below, if applicable:

Full Name Howard W. DeMoore

Address 10954 Shady Trail

Dallas, Texas 75220

__X__ individual ____ small business concern

____ nonprofit organization

I acknowledge the duty to file, in this application or patent, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small entity is no longer appropriate pursuant to 37 C.F.R. §1.28(b).

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application, any patent issuing thereon, or any patent to which this verified statement is directed.

Printed Name of Inventor: John W. Bird

Date: May 1, 1995 _____
Signature of Inventor

Attorney Docket No.
B6012

SMALL ENTITY
SMALL BUSINESS CONCERN

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

VERIFIED STATEMENT (DECLARATION) CLAIMING SMALL ENTITY STATUS (37 C.F.R. §1.9(f) and §1.27(c))— SMALL BUSINESS CONCERN

I, HOWARD W. DEMOORE

hereby declare that I am

___ the owner of the small business concern identified below:

_X_ an official of the small business concern empowered to act on behalf of the concern identified below:

NAME OF CONCERN Printing Research, Inc.

ADDRESS OF CONCERN 10954 Shady Trail
Dallas, Texas 75220

I hereby declare that the above-identified small business concern qualifies as a small business concern as defined in 13 C.F.R. §121.3-18, and reproduced in 37 C.F.R. §1.9(d), for purposes of paying reduced fees under Section 41(a) and (b) of Title 35, United States Code, in that the number of employees of the concern, including those of its affiliates, does not exceed 500 persons. For purposes of this statement, (1) the number of employees of the business concern is the average over the previous fiscal year of the concern of the persons employed on a full-time, part-time or temporary basis during each of the pay periods of the fiscal year, and (2) concerns are affiliates of each other when, either directly or indirectly, one concern controls or has the power to control the other, or a third-party or parties controls or has the power to control both.

I hereby declare that rights under license, contract or law have been acquired by or conveyed to and remain with the small business concern identified above with regard to the invention entitled

"RETRACTABLE INKING/COATING APPARATUS HAVING FERRIS MOVEMENT BETWEEN PRINTING UNITS"

by inventors Ronald M. Rendleman, Howard W. DeMoore and John W. Bird

as described in

_X_ the specification filed herewith.

___ the specification filed _____ under Serial No. _____.

___ Patent No. _____, issued _____.

If the rights held by the above-identified small business concern are not exclusive, each individual, concern or organization having rights to the invention is listed below and no rights to the invention are held by any person, other than the inventor, who could not qualify as a small business concern under 37 C.F.R. §1.9(d) or by any concern which would not qualify as a small business concern under 37 C.F.R. §1.9(d) or a nonprofit organization under 37 C.F.R. §1.9(e).

_X_ no such person, concern or organization exists

____ any such person, concern or organization is identified below, if applicable:

Full Name_____

Address_____

_____

____ individual ____ small business concern

____ nonprofit organization

I acknowledge the duty to file, in this application or patent, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small business entity is no longer appropriate. (37 C.F.R. §1.28(b)).

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or

imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application, any patent issuing thereon, or any patent to which this verified statement is directed.

TYPED NAME OF PERSON SIGNING Howard W. DeMoore

TITLE OF PERSON OTHER THAN OWNER President and Chairman of the Board

Date: May 1, 1995

Howard W DeMoore
Signature

86017
RONALD M. RENDLEMAN
HOWARD W. DEMOORE
JOHN W. BIRD

08 435798

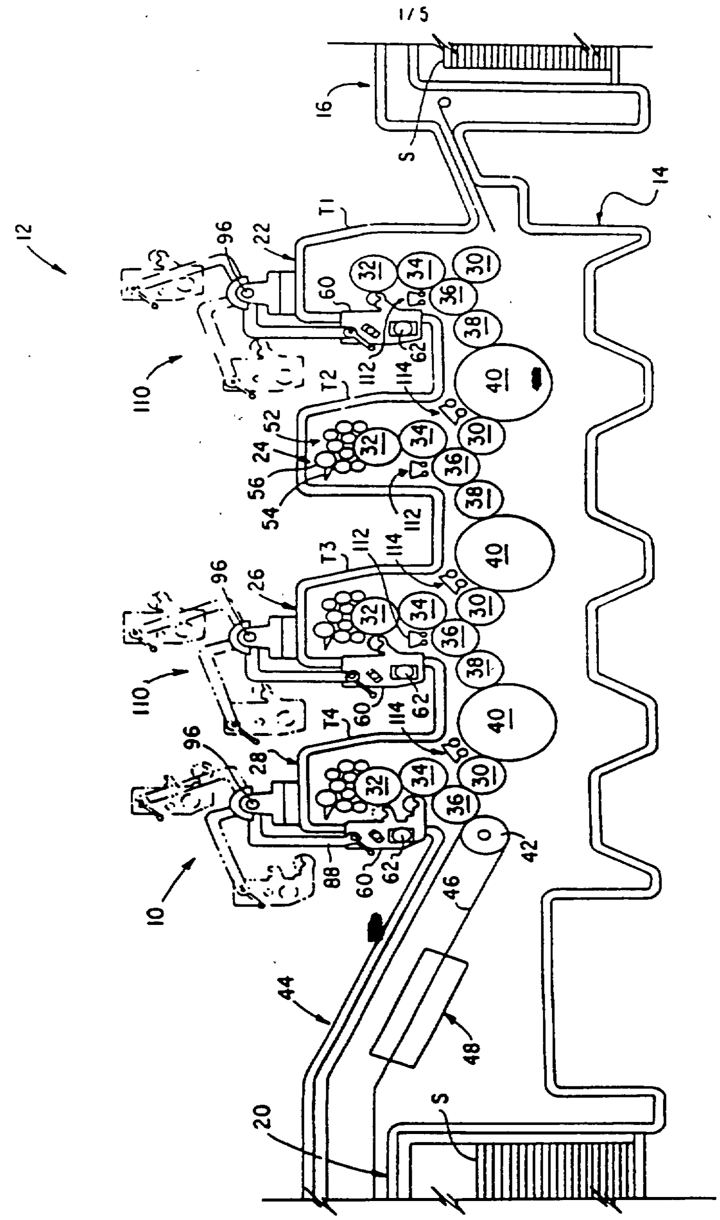
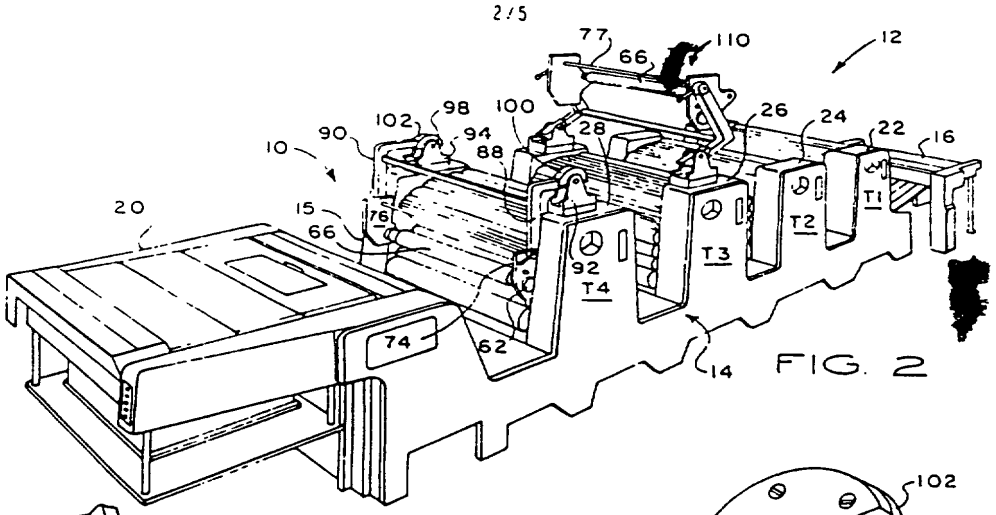


FIG. I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T2
T3
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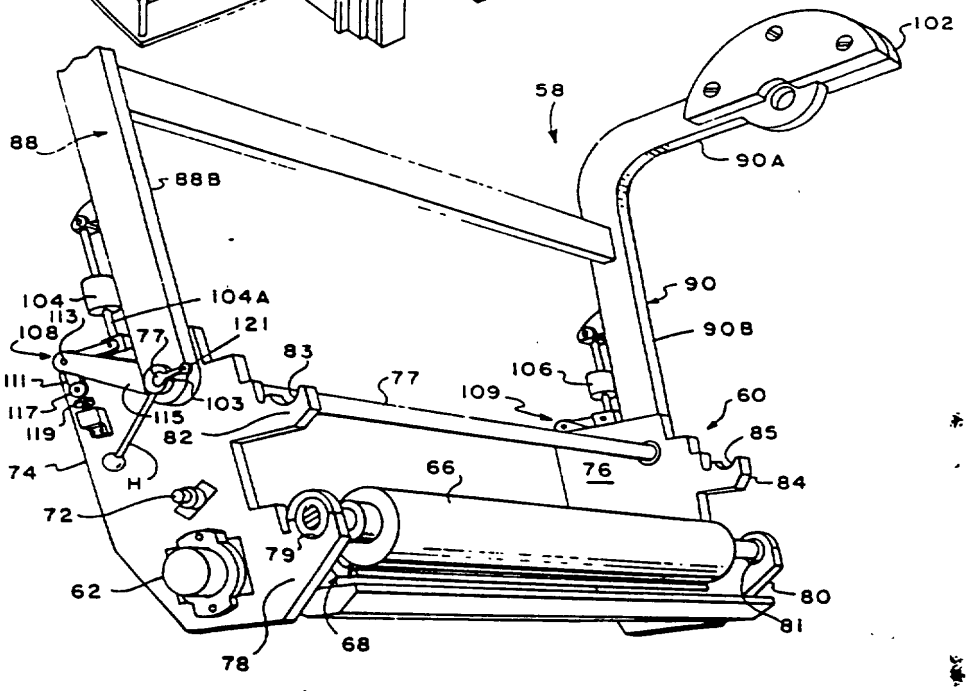
T4
74
62
14

FIG. 2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119
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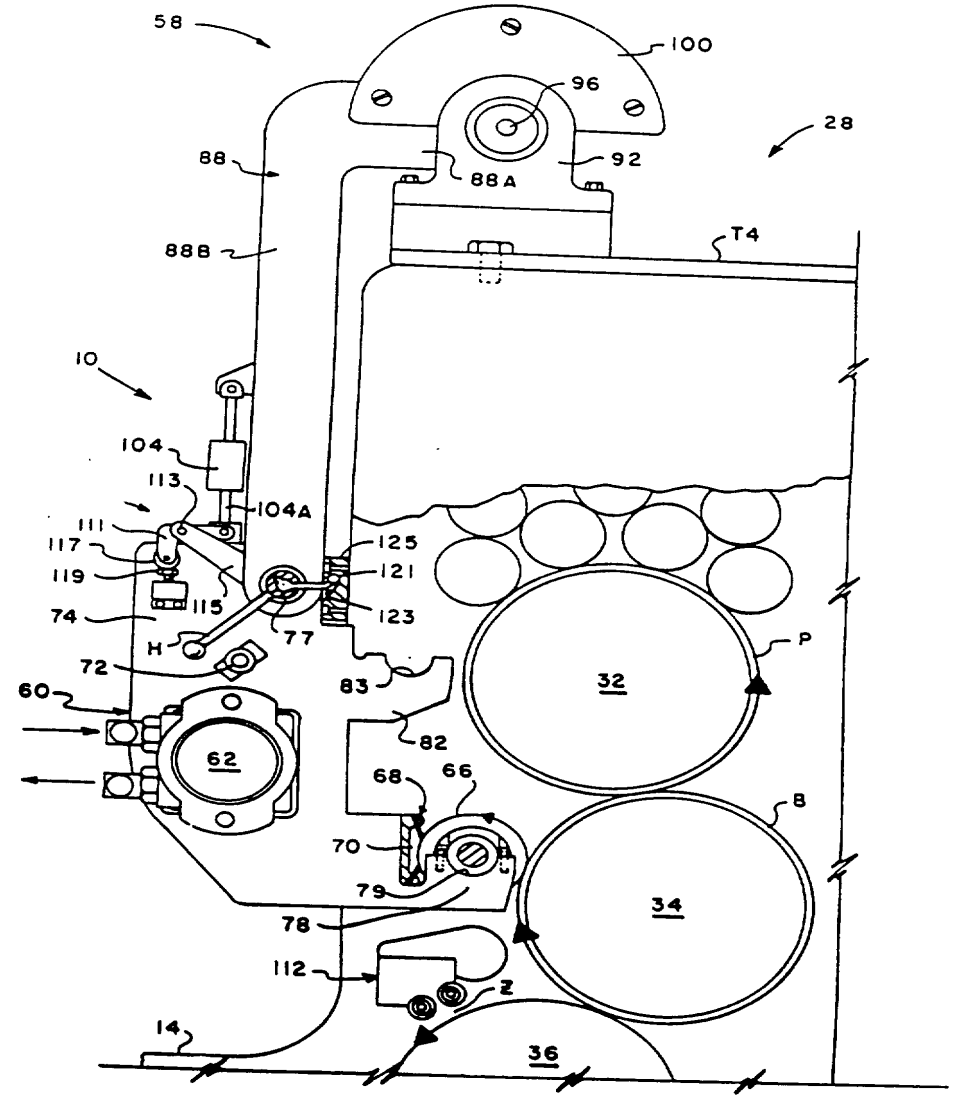
FIG. 3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77
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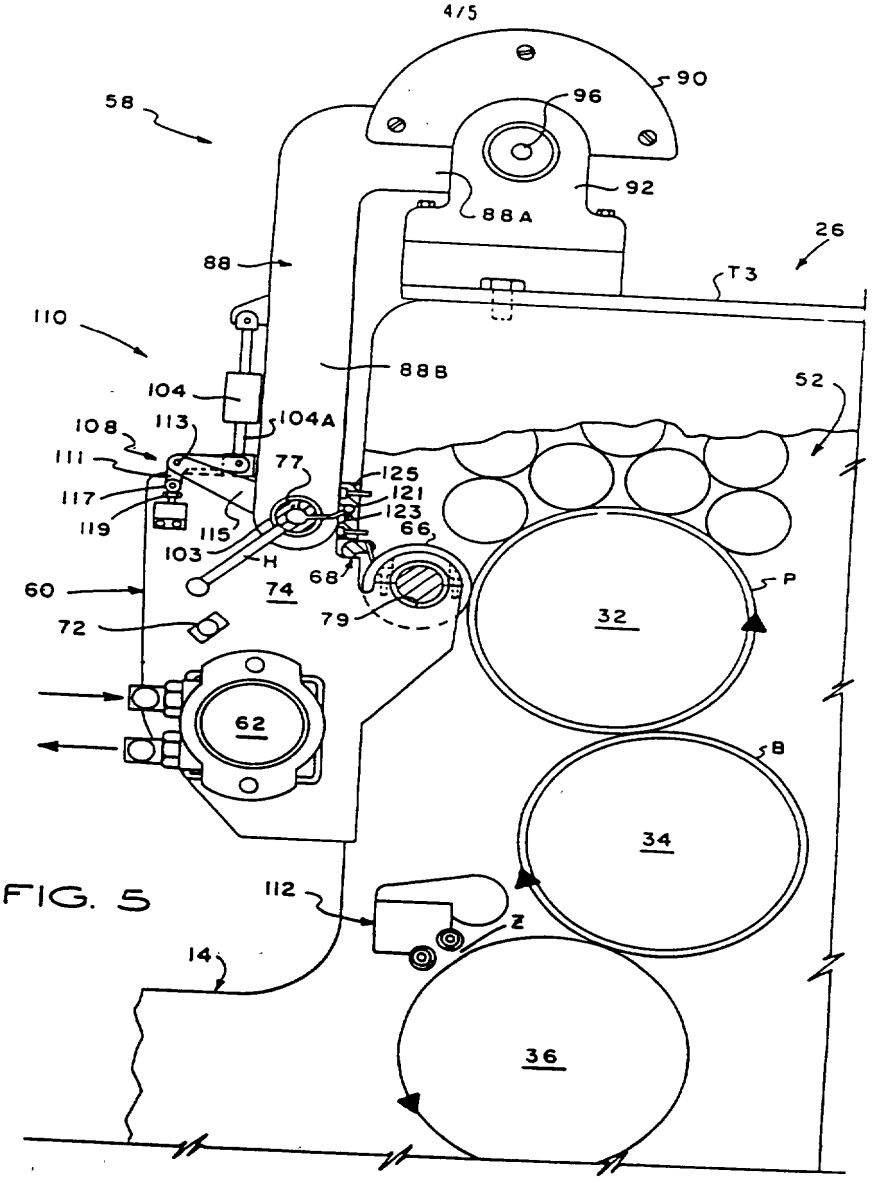
FIG. 4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H
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72
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FIG. 5

U.S. DEPARTMENT OF COMMERCE
United States Patent and Trademark Office

THIS IS TO CERTIFY that page (s) Fig. 6 is missing from the U.S. Patent and Trademark Office microform records.

K. White
Certifying Officer

5/16/96
DATE

EXHIBIT D

to comply with a provision which "is both reasonable and of material significance to the franchise relationship" pursuant to § 2802(b)(2)(A), which justified nonrenewal. Moreover, plaintiff's failure to maintain the premises in a clean manner is also a proper ground for nonrenewal under § 2802(b)(3)(C). Therefore, defendant can properly end the franchise relationship with the plaintiff.

PENNWALT CORPORATION, Plaintiff,

v.

AKZONA INC. and Armak Co., Defendants.

Civ. A. No. 79-157.

United States District Court, D. Delaware.

Aug. 22, 1983.

Plaintiff brought declaratory judgment action to declare invalid and unenforceable patent it had already infringed. The District Court, Latchum, Chief Judge, held that: (1) patent was invalid as "in public use"; (2) parties' product development agreement afforded no basis for holding plaintiff liable for damages for breach of contract; (3) plaintiff was not liable to defendant for breach of contract implied from unauthorized use of its trade secret or unauthorized use of its trade secret unjustly enriching plaintiff; and (4) plaintiff was not entitled to attorney fees under statute providing for such fees in "exceptional case."

Ordered accordingly.

1. Patents ⇐90(1)

To come within purview of statute allowing later-filed patent application to claim benefit of one or more earlier filed applications, later application must, among other things, disclose same invention as has previously been disclosed in each prior application, and each application must comply with statute governing specification. 35 U.S.C.A. §§ 112, 120.

2. Patents ⇐90(1)

Claims of patent were not entitled to filing date of grandparent application, because they depend on entirely new matter added by subsequent continuation-in-part application, and because for purposes of statute governing specification, the prior application lacked an enabling disclosure and failed to set forth best mode. 35 U.S.C.A. §§ 112, 120.

3. Patents ⇐99

Mere reference to another application, patent or publication, is not an incorporation of anything therein into application containing such reference for purpose of disclosure required by patent statute governing specification. 35 U.S.C.A. § 112.

4. Patents ⇐76, 80

Plaintiff's sales of its trademarked agricultural insecticide suspended in xanthan gum, in accordance with claims of patent pertaining to an insecticidal composition, were made more than one year prior to filing date of patent application, and such public use and sales were not justified under "experimental use" doctrine, notwithstanding that sales were made under temporary Environmental Protection Agency experimental use permit; therefore, those sales constituted an absolute statutory bar to patentability under statute providing that no patent will be granted where invention was in public use or on sale one year prior to date of application for patent. 35 U.S.C.A. § 102(b).

5. Patents ⇐80

Patent No. 4,196,292, pertaining to an insecticidal composition consisting essentially of a polymer-encapsulated insecticide suspended in an aqueous dispersion of xanthan gum, was invalid under statutory subsection providing that a person shall be

entitled to a patent unless, inter alia, invention was in public use or on sale in United States more than one year prior to date of application for patent. 35 U.S.C.A. § 102(b).

6. Patents ⇐80

Single unrestricted public use or sale brings into operation bar to patentability set forth in statute providing that no patent will be granted where invention was in public use or on sale in United States more than one year prior to date of patent application. 35 U.S.C.A. § 102(b).

7. Patents ⇐75, 76

Bar to patentability set forth in statute providing that a person shall be entitled to a patent unless, inter alia, invention was in public use or on sale in United States more than one year prior to date of application for patent does not require invention to be placed in public use or on sale by patentee because such use or sale by third party, with or without consent of inventor, is sufficient to invalidate any patent subsequently obtained if use or sale occurred more than one year prior to issue. 35 U.S.C.A. § 102(b).

8. Patents ⇐75, 76

"Experimental use" doctrine, developed under patent law, which is an exception to bar to patentability set forth in statute providing that no patent will issue where invention was in public use or on sale in United States more than one year prior to date of patent application, is not coextensive with and does not have same meaning as "experimental use" of pesticides conducted under an Environmental Protection Agency temporary permit issued under environmental protection laws. 35 U.S.C.A. § 102(b).

9. Patents ⇐75, 76

Bar to patentability in statute providing that a person shall be entitled to patent unless invention was in public use or on sale in United States more than one year prior to date of application for patent, can be extended for reasonable period if experimentation is undertaken to demonstrate utility of claimed invention and its lack of need for further improvement. 35 U.S.C.A. § 102(b).

10. Patents ⇐75, 76

For purposes of bar to patentability in statute providing that no patent will be granted where invention was in public use or on sale in United States more than one year prior to date of application for patent, and exception to that bar for "experimental use," use or sale labeled "experimental" by government regulatory agency is not necessarily "experimental" under patent laws. 35 U.S.C.A. § 102(b).

11. Patents ⇐75

Experimentation to perfect nonclaimed features of an invention does not fall within experimental-use exception to bar to patentability in statute providing that a person shall be entitled to a patent unless, inter alia, invention was in public use or on sale in United States more than one year prior to date of application for patent. 35 U.S.C.A. § 102(b).

12. Patents ⇐81

For purposes of experimental-use exception to bar to patentability set forth in statute providing that no patent will issue where invention was in public use or on sale in United States more than one year prior to date of application for patent, absence of any restriction by patentee on uses of patented invention is indicative of nonexperimental purpose. 35 U.S.C.A. § 102(b).

13. Patents ⇐81

To avoid bar to patentability set forth in statute providing that a person shall be entitled to a patent unless invention was in public use or on sale in United States more than one year prior to date of patent application, inventor must show that transferee lacked authority to use invention or exploit its commercial value, but where an inventor sells or delivers invention to another without any enforceable obligation for other to hold invention for experimental purposes only, unrestricted sale or delivery will invalidate the patent. 35 U.S.C.A. § 102(b).

14. Patents ⇐81

For purposes of experimental-use exception to bar to patentability in statute providing that no patent will be granted where invention was in public use or on sale in United States more than one year prior to date of application for patent, a factor that is indicative of nonexperimental purpose is failure to require test reports. 35 U.S.C.A. § 102(b).

15. Patents ⇐75, 76

Where person has authority to use invention commercially or sell to others without any duty to experiment further, there is a "sale" within meaning of statute providing that person shall be entitled to patent unless invention was in public use or on sale in United States more than one year prior to date of application for patent, and experimental-use exception does not apply. 35 U.S.C.A. § 102(b).

16. Patents ⇐75

Market testing and product introduction are not "experimental uses" for purposes of experimental-use exception to bar to patentability set forth in statute providing that a person shall be entitled to a patent unless invention was in public use or on sale in United States more than one year prior to date of application for patent. 35 U.S.C.A. § 102(b).

17. Patents ⇐75, 76

Experimental-use exception to bar to patentability in statute providing that no patent will issue where invention was in public use or on sale in United States more than one year prior to date of application for patent, applies to experiments of inventor or persons under his control, not to third parties. 35 U.S.C.A. § 102(b).

18. Contracts ⇐170(1)

Faced with contradictory testimony, courts turn, as an important aid to construction of contract, to examine practical construction placed on agreement by parties themselves.

19. Contracts ⇐201

Xanthan gum was not within scope of parties' product development agreement, and therefore defendant's submission of that material to plaintiff for use as a suspending agent was not pursuant to that agreement so as to obligate plaintiff to enter into licensee agreement and pay royalties thereunder.

20. Implied and Constructive Contracts ⇐3

Plaintiff, which used defendant's product as a suspending agent in its insecticide, was not liable to defendant for breach of contract implied from unauthorized use of defendant's trade secret or unauthorized use of defendant's trade secret unjustly enriching plaintiff, because when defendant first requested plaintiff's help in solving problem with insecticide, it was seeking free technical or customer service, when defendant shipped samples it never indicated that compensation was expected, and defendant did not indicate that responding to plaintiff's request for customer service, defendant was intending to establish a confidential relationship.

21. Patents ⇐325.11(3)

There were genuine issues of material fact in dispute over validity of patent which could not be resolved by summary judgment; therefore, bad faith could not be attributed to defendant for opposing plaintiff's summary judgment motion so as to make case "exceptional" and entitle plaintiff to attorney fees under statute. 35 U.S.C.A. § 285.

22. Patents ⇐325.11(3)

Where patent was found to be invalid under "in public use" and "on sale" statutory bar, and court intentionally refrained from passing on all of plaintiff's claims that patent was unenforceable on ground that fraud was practiced in Patent Office, plaintiff was not entitled to attorney fees on basis that patentee intentionally practiced fraud upon Patent Office so as to make case "exceptional" within meaning of statute providing for fees. 35 U.S.C.A. § 285.

Robert K. Payson and Michael D. Goldman of Potter, Anderson & Corroon, Wil-

mington, Del., Arthur H. Seidel and Daniel A. Monaco of Seidel, Gonda & Goldhammer, P.C., Philadelphia, Pa., of counsel, for plaintiff.

John G. Mulford of Theisen, Lank, Mulford and Goldberg, P.A., Wilmington, Del., and Phillip M. Mayer of Leydig, Voit, Osann, Mayer & Holt, Ltd., Chicago, Ill., for defendants.

OPINION

LATCHUM, Chief Judge.

Pennwalt Corporation ("Pennwalt") commenced this patent suit on March 26, 1979 in which it seeks a declaratory judgment of invalidity and unenforceability of U.S. Patent No. 4,196,292 ("the '292" or "Nemeth patent") entitled "Stable Water Dispersions of Encapsulated Parathion," issued August 15, 1978 to Harold C. Nemeth. (Docket Item ["D.I."] 1.) The named defendants are Akzona, Inc. ("Akzona"), and its subsidiary Armak Co. ("Armak"). (*Id.*). The '292 patent is assigned to Akzona but the parties have agreed that Armak should be treated as the patent owner for purposes of this litigation. (D.I. 99, ¶ 1.) Armak has counterclaimed, charging that Pennwalt's agricultural insecticide trademarked "Penncap M" [1] infringes the '292 patent and in addition seeks substantial damages from Pennwalt for Penncap M sales over a six year period before the '292 patent issued based on three alternative theories: (a) breach of the 1963 Product Development Agreement ("PDA") entered into between the parties, (b) breach of implied contract to pay for the use of a trade secret, and (c) unjust enrichment for using confidential information. (D.I. 29.) Pennwalt does not contest infringement of the '292 patent (D.I. 99, ¶ 29), but has raised the defenses of the statute of limitations, laches, waiver and estoppel to Armak's counterclaim for breach of contract, breach of implied contract, and unjust enrichment. (D.I. 100 & 102.) The opposing parties seek attorneys' fees under 35 U.S.C. § 285. (D.I. 99, ¶ 1.)

The liability phase of this case was tried to the Court without a jury for nine days between February 18 and February 25, 1983. The parties have completed their post-trial briefing (D.I. 128, 129 & 130) and the case is ready for a decision on the liability issues.

Pennwalt specifically contends that the '292 patent is invalid for any one of the following reasons: (1) under 35 U.S.C. § 103 because the subject matter claimed in the '292 patent was obvious; (2) under 35 U.S.C. § 102(g) because the patented Nemeth invention was made in this country before Nemeth by a Pennwalt employee, Chester B. DeSavigny, who had not abandoned, suppressed or concealed it; (3) under 35 U.S.C. § 102(b) because the '292 invention was publicly used and on sale more than one year prior to the filing of the continuation-in-part Serial No. 457,152 ("the '152 application") on April 1, 1974, the first application complying with the requirements of 35 U.S.C. § 112, and because Nemeth is not entitled to the March 1, 1972 filing date of application Serial No. 230,935 ("the '935 application") under 35 U.S.C. § 120 in that the '935 application failed to set forth the "best mode" known to Nemeth and lacked an enabling disclosure as required by 35 U.S.C. § 112.

Finally, Pennwalt argues that the patent is unenforceable because it was procured by fraud upon the Patent Office in that: (1) Nemeth and Armak failed to advise the Patent Office that Pennwalt was making the claimed invention and selling it for more than a year before the filing date of the '152 application; (2) Nemeth falsely represented in the '935 application that he had conducted field tests prior to March 1, 1972; (3) Nemeth deliberately misidentified General Mills' experimental gums "X–383S" and "XG–458S" to the Patent Office as xanthan gum in the '935 application; (4) Nemeth concealed the fact that tragacanth gum "worked" in the '935 application; (5)

1. Pennwalt's agricultural insecticides are trademarked as "Penncap M," "Penncap E," and "Knox-out," but the parties agree that "Penncap M" should be considered as representative of all of Pennwalt's alleged infringing products. (D.I. 99, ¶ 1.)

Nemeth misrepresented that his invention was the result of a "long search" in the '152 application; and (6) Table IV of the '292 patent is the result of concealment and commingling of laboratory data and procedures.

I. VALIDITY

1. *Earliest Filing Date*

The '292 patent pertains to an insecticidal composition consisting essentially of a polymer-encapsulated insecticide suspended in an aqueous dispersion of xanthan gum (D.I. 99, ¶ 3.5). On its face, the '292 patent claims the benefit of the March 1, 1972 filing date of the '935 original grandparent application. (TX 201.)[2] Pennwalt contends that the '292 patent is not entitled to the March 1, 1972 filing date and the Court agrees.

[1] 35 U.S.C. § 120 allows a later-filed application, under specified circumstances, to claim the benefit of one or more earlier filed applications. It is well established that to come within the purview of § 120, (1) a later application must, among other things, disclose the same invention as has previously been disclosed in each prior application, and (2) each application must comply with 35 U.S.C. § 112. 35 U.S.C. § 120; *see, e.g., Acme Highway Products Corp. v. D.S. Brown Co.*, 431 F.2d 1074, 1078 (6th Cir.1970), *cert. denied*, 401 U.S. 956, 94 S.Ct. 125, 38 L.Ed.2d 57 (1971); *Bendix Corp. v. Balax, Inc.*, 421 F.2d 809, 816–17 (7th Cir.), *cert. denied*, 399 U.S. 911, 90 S.Ct. 2203, 26 L.Ed.2d 562 (1970), *reh. denied*, 414 U.S. 819, 94 S.Ct. 43, 38 L.Ed.2d 51 (1973); *Chromalloy American Corp. v. Alloy Surfaces Co.*, 339 F.Supp. 859, 874 (D.Del.1972).

[2] In the present case, the claims of the '292 patent are not entitled to the filing date of the grandparent application '935 of March 1, 1972, because they depend on entirely new matter added by the continuation-in-part ("C.I.P.") application '152 filed on April 1, 1974.

Claim 1, the broadest claim of the '292 patent, recites the following insecticidal composition (TX 201, Col. 14, line 52):

> 1. An insecticidal composition consisting essentially of an aqueous dispersion of:
>
> (a) from about 1% to about 40% by weight of said composition of capsules of a member of the group consisting of a phosphoromonothioate and a phosphorodithioate insecticide encapsulated in a skin selected from the group consisting of a polyamide, a polyurea, and a mixed polyamide-polyurea cross-linked with a cross-linking agent selected from the group consisting of a polyalkylene polyamine and a polyfunctional isocyanate;
>
> (b) from about 0.1% to about 0.5% by weight of said composition of a xanthan gum dispersant for said capsules; and
>
> (c) balance water.

Succinctly stated, three distinct types of polymer encapsulated insecticides are claimed: polyamide capsule; polyurea capsule; and cross-linked polyamide-polyurea capsule.

However, the '935 application discloses only xanthan gum dispersions of *polyamide* -encapsulated insecticides (PX 900 "O"). Nowhere in the '935 file wrapper is there any reference of polyurea-encapsulated insecticides, nor is there mention of cross-linked polyamide-polyurea encapsulated insecticides (PX 900 "O"; Tr. 1466–73). Nowhere in the '935 application is there any teaching that isocyanates could be used to produce polyureas or polyamide-polyurea copolymers (PX 900 "O"; Tr. 1467). The sole teaching of the '935 application is directed to polyamide microcapsule suspensions (PX 2, pp. 4–6, 8).

The only specific polyamide taught in the '935 application is the reaction product of adipoyl chloride and lysine in the "Background of the Invention" (PX 2, p. 5). This reaction produces a linear, non-crossed-linked polyamide (Tr. 903).

2. TX refers to Armak's trial exhibits and PX refers to Pennwalt's trial exhibits; Tr. refers to the trial transcripts found in D.I. 116 through 124.

Claim 1 of the '292 patent defines encapsulating polymers in a Markush group (TX 201, col. 14, line 57):

> [E]ncapsulated in a skin selected from a group consisting of a polyamide, a polyurea, and a mixed polyamide-polyurea cross-linked ....

The members of a Markush group are *exclusive* with respect to each other (Tr. 1470). The Manual of Patenting Examining Procedure ("MPEP") states that a Markush "type of claim is employed where there is no commonly accepted generic expression which is commensurate in scope with the field which the applicant desires to cover" (PX 1002), and this rule has been part of MPEP since at least 1964 (Tr. 1472). Nemeth, having included polyamide and polyamide-polyurea copolymers in a Markush group in the '292 claim, is now estopped from asserting in this litigation, that "polyamide" used in the '935 application is generic for cross-linked polyamide-polyurea. Indeed, there is no teaching in the '935 application that "polyamide" is used other than in its ordinary meaning to an organic chemist, which would be a plastic with long linear molecules. (Tr. 1467.)

Furthermore, there is no presumption of entitlement to the '935 filing date by the issuance of the '292 patent. The effective date of the C.I.P. claims (and the claims of the '292 patent) was never decided by the Patent Examiner. Under the MPEP, patent examiners do not ordinarily make such determinations, except in the case of "intervening art" or in case of an interference (PX 1001):

> Unless the filing date of the earlier application is actually needed, for example, in the case of an interference or to overcome a reference, there is no need to make a determination as to whether the requirement of 35 U.S.C. 120, that the earlier application disclose the invention of the second application in the manner provided by the first paragraph of 35 U.S.C. 112, is met and whether a substantial portion or all of the earlier application is repeated in the second application in a continuation-in-part situation.

MPEP § 201.08 (1982 rev.)

While the above provision was added to the MPEP after the filing date of C.I.P. '152 application, it represents a codification of pre-existing Patent Office Practice (Tr. 1459). Thus the Examiner of the '292 patent never determined the effective filing date of the claims in that patent. The new matter added by the C.I.P. on April 1, 1974 which was not disclosed in the earlier '935 application is not entitled under 35 U.S.C. § 120 to filing date of the earlier '935 application for non-disclosed matter. Such non-disclosed matter is entitled to the filing date of the C.I.P. filed on April 1, 1974. *In re Lukach,* 442 F.2d 967, 969, 58 CCPA 1302 (1971); *In re Ruscetta and Jenny,* 255 F.2d 687, 690–91, 45 CCPA 968 (1958); *In re Steenbock,* 83 F.2d 912, 913 (Cust. & Pat.App.1936).

Secondly, as mentioned earlier, in order to obtain the benefit of the filing date of a co-pending patent application, the claims of a C.I.P. application, in accordance with 35 U.S.C. § 120, must comply with the "enabling" and "best mode" disclosure requirements of the first paragraph of 35 U.S.C. § 112.

The '935 application was finally rejected by the Patent Examiner because it lacked an enabling disclosure and failed to set forth the best mode (PX 2, pp. 35–38). The basis for both rejections was substantially the same, that is, the '935 application described the encapsulating material only as a "polyamide" without identifying a specific polyamide or a method of preparation. (*Id.*).

"Polyamide" encompasses a virtually unlimited variety of diverse chemical compounds (Tr. 314; 528; 905; 1123). Armak argues that "polyamide" is not so vast and that one skilled in the art would ignore the limitless linear polyamides which do not work and focus only on narrow subgenus polyamide types possessing the requisite time-release qualities necessary for use as insecticide microcapsules, in other words,

the cross-linked polyamide-polyurea copolymers (D.I. 128, pp. 80–83).

However, as above mentioned, the only specific polyamide that appears in the '935 application is under the "Background of the Invention" and not under "detail Description of the Invention" or under "Examples," the usual place where one skilled in the art would expect to find an enabling disclosure of the claimed invention (PX 2, p. 5). But as discussed above, the adipoyl chloride-lysine reaction referred to therein produces a linear non-cross-linked polyamide, lacking time release characteristics (Tr. 902–904). The capsule releases its contents by degradation not by diffusion (Tr. 1186). The capsule so formed is especially susceptible to degradation induced by interaction with negatively charged chemicals, is thin-walled and fragile and will rupture during passage through spraying equipment (Tr. 1180–81; 1034).

The Patent Examiner expressly held that the teaching of adipoyl chloride-lysine capsules in the "Background of the Invention" did not sufficiently characterize the capsules and could not be considered a specific "polyamide" as required by the best mode requirements of § 112 (PX 2, p. 26). Nemeth argued in reply that the disclosure of "polyamide" in the '935 application coupled with the three Pennwalt U.S. Patents and one Pennwalt British Patent [3] referred to in the "Background" constituted both an enabling and best mode disclosure (PX 2, pp. 30–31). The Patent Examiner disagreed and expressly ruled that the four Pennwalt patents were not incorporated by reference (PX 2, pp. 36–38). No appeal was taken by Nemeth.

Armak relies on one of the four Pennwalt patents, cited in the '935 application [the British Vandegaer patent, 1,091,141 (PX 603)] to supply an enabling disclosure. However, the Patent Examiner specifically ruled that this British patent was not incorporated by reference in the '935 application because MPEP 608.01(p) provides that "essential material may not be incorporated by reference to foreign patents" (PX 2, p. 36). To allow Armak now in this litigation to claim that the four Pennwalt patents add an enabling disclosure to the '935 application would render the MPEP a nullity.

[3] The Patent Examiner further ruled that the British Vandegaer '141 and the other three Pennwalt patents were not part of the '935 disclosure because they were not included with the requisite specificity. A mere *reference* to another application, patent or publication, is not an *incorporation* of anything therein into the application containing such reference for the purpose of the disclosure required by 35 U.S.C. § 112. *In re Seversky,* 474 F.2d 671, 674 (Cust. & Pat.App.1973).

Even assuming that the four Pennwalt patents were properly incorporated in the '935 application, it is still non-enabling because one skilled in the art could not make and use the invention without undue experimentation. The Pennwalt microencapsulation patents (PX 600–603) teach a wide range of encapsulating polymers. British Vandegaer '141, in particular, teaches an infinite variety of polymers (Tr. 1126–27). The '935 application contains no teaching leading one skilled in the art through this range of polymers to the cross-linked polyamide and polyurea copolymers which support the claims of the '292 patent. One skilled in the art would be directed to "polyamide" capsules, specifically the ingestible capsule of Santo '776 (PX 602) which is wholly unsuitable as a time-release insecticide microcapsule.

The Court also finds that *In re Herschler,* 591 F.2d 693 (Cust. & Pat.App.1979), upon which Armak relies, is not applicable to this case because the written description in the '935 application which discloses the sole encapsulating material as "polyamide," (which does not work) furnishes absolutely no guide to predicting polymers which may be used to encapsulate insecticides. Thus the Court finds that the claims of the '292

3. Pennwalt's U.S. Patents referred to in the '935 application were Nos. 3,464,926 (PX 600); 3,492,380 (PX 601); and 3,607,776 (PX 602) and Pennwalt's British Patent No. 1,091,141 (PX 603).

patent are not supported by the disclosures in the '935 application and they are not entitled to the '935 filing date of March 1, 1972. *In re Smith,* 458 F.2d 1389, 1394, 59 CCPA 1025 (1972); *In re Lukach,* 442 F.2d 967, 969, 58 CCPA 1233 (1971); *In re Ahlbrecht,* 435 F.2d 908, 910–11, 58 CCPA 848 (1971).

Finally, the '935 application did not disclose the best mode as required by § 112. The only mode known to Nemeth prior to March 1, 1972 was a xanthan gum suspension of Penncap M's microcapsules. Nemeth's original suspension tests were conducted in April, 1971 when he used xanthan gum, trademarked as Kelzan by Kelco Co., to suspend "Penncap M" capsules (Tr. 100–106). By August, 1971, Nemeth knew that the Pennwalt material that he was working with was Pennwalt's encapsulated methyl parathion commercially identified as "Penncap M" (Tr. 83; TX 129 at Bates A07068). Also prior to filing the '935 application, Armak's patent attorney who prosecuted the '935 application knew that Pennwalt's microencapsulated insecticide carried the trademark "Penncap M" (Tr. 537; PX 18). However, Armak chose not to identify this material by Pennwalt's trademark. This was not done until the later-filed '152 C.I.P. Thus, the best mode and only mode known to Nemeth was not disclosed in the '935 application as required by § 112.

Accordingly, the Court finds that the claims of the '292 patent are not entitled to the March 1, 1972 filing date of the '935 application but can only be accorded the filing date of the C.I.P. '152 application on April 1, 1974. This finding should not come as a surprise to Armak. Sidney Shapiro, who was Nemeth's supervisor in 1971 and who followed the patent proceedings (Tr. 229), believed in early 1974 that Armak was not entitled to the 1972 filing date of the '935 application. Shapiro wrote in a memorandum, dated January 24, 1974:

> 2. *"Serial No. 230,935 by Harold Nemeth filed March 1, 1972"*
>
> *This filing date has been lost* and we will have to refile. We are shooting for a mid-February new filing date. We cannot file earlier until we obtain a definition of the nature of the capsules given in examples in the Pennwalt patent. [Emphasis added].

(PX 38; *see also* Tr. 349.)

Furthermore, this also appears to have been the belief of Jack Hall, Armak's attorney, who prosecuted the '935 application and filed the C.I.P. '152 application (Tr. 601–603).

2. *In Public Use and On Sale Issue*

The Court having determined that the claims of the '292 patent can only be accorded the April 1, 1974 filing date of the C.I.P. '152 application (the first application complying with the requirements of § 112), the Court must next decide whether the patented invention was in public use or on sale in this country more than one year prior to April 1, 1974 as Pennwalt contends.

The evidence is undisputed that between July 18 and August 7, 1972, Pennwalt manufactured at its plant in Bryan, Texas, six batches of approximately 4,300 gals. of Penncap M suspended in xanthan gum acquired from Armak and designated by Armak as "RD–4237" (PX 508; Tr. 922–23).[4] Prior to packaging the Penncap M into 5-gallon containers, by Pennwalt, a sample of each batch was removed for three-part quality control testing: (1) chemical assay, (2) toxicology, and (3) cricket bioassay, and each of the six batches of Penncap M produced in 1972 with RD–4237 passed all three tests and were released for sale (Tr. 931–33; 735–47; PX 504 and 544).

Armak sent several samples of RD–4237 to Pennwalt in 1971 and an additional pound was sent February 18, 1972. A 20-pound shipment was received by Pennwalt before the July 18, 1972 first batch was run. In response to Pennwalt's request, 100

4. The material Armak furnished to Pennwalt under its designation "RD–4237" was an industrial grade xanthan gum which Armak purchased from Kelco Co., under the latter's trademark "Kelzan," but Armak removed the Kelzan labels before shipping the xanthan gum to Pennwalt (Tr. 70, 97–100; 253–54).

pounds of RD–4237 free of charge was shipped on July 21, 1972 and finally a 300-pound shipment of RD–4237 was sent in August, 1972, and represented Pennwalt's first purchase of RD–4237 from Armak. (D.I. 99, ¶¶ 3.24 & 26.) Nemeth, who supervised the shipments, was aware that the xanthan gum would be used by Pennwalt at 0.1–0.5 weight per cent to suspend Penncap M (TX 178 at Bates A005351, Tr. 123).

Despite a diligent search,[5] only six Pennwalt sales invoices have been found which showed that 1,220 gallons of Penncap M dispersed in xanthan gum were sold from the six batches made in 1972 (PX 509; Tr. 944–53). These invoices reflect the following sales: (1) Pennwalt on August 22, 1972 sold 400 gallons from the August 2, 1972 batch to Helena Chemical Company for $900 (PX 509 at Bates 04282–284; Tr. 948, 827); (2) Pennwalt on four different occasions between August 24 and September 19, 1972 sold 1,015 gallons to Smith-Douglas of Norfolk, Va., the distribution branch of Borden Company, for $4,567.50 (PX 509 at Bates 04283–85, 04287, 04288); and (3) on August 29, 1972 Pennwalt sold a 5-gallon can to Stauffer Chemical Company in Houston, Texas for $22.50 (PX 432D; Tr. 1205).

These sales of Penncap M, except for the Stauffer sale, were made directly to distributors who sold to farmer users (Tr. 827). Stauffer purchased Penncap M solely for its own purpose of evaluating a competitor's product (Tr. 1191–92). The $4.50 per gallon distributor price reflected on the invoices was set at that price to allow normal distributor and retail margins (Tr. 1429).

[4–7] These sales of 1,220 gallons of Penncap M suspended in xanthan gum in accordance with the claims of the '292 patent, were all made prior to April 1, 1973 and without question constitute an absolute statutory bar under 35 U.S.C. § 102(b) rendering the '292 patent invalid. This is so because a single unrestricted public use or sale brings into operation this bar to patentability. *Consolidated Fruit Jar v. Wright,* 94 U.S. 92, 94, 24 L.Ed. 68 (1876); *General Electric Co. v. United States,* 228 Ct.Cl. 192, 654 F.2d 55, 59 (1981); *In re Theis,* 610 F.2d 786, 791 (Cust. & Pat.App. 1979). Furthermore, the § 102(b) bar does not require the invention to be placed in public use or on sale by the patentee because such use or sale by a third party, with or without the consent of the inventor, is sufficient to invalidate any patent subsequently obtained if the use or sale occurred more than a year prior to issue. *Andrews v. Hovey,* 124 U.S. 694, 719, 8 S.Ct. 676, 686, 31 L.Ed. 557 (1888); *Hobbs v. United States,* 451 F.2d 849, 859–60 (5th Cir.1971); *O'Brien v. Westinghouse Elec. Co.,* 293 F.2d 1, 10 (3d Cir.1961); *Lorenz v. Colgate-Palmolive-Peet Co.,* 167 F.2d 423, 429 (3d Cir. 1948); *Noma Lites Canada Ltd. v. Westinghouse Elec. Corp.,* 399 F.Supp. 243, 253 (D.D.C.1975).

Indeed, Armak does not contest the factual or the legal basis of the public use and sale of the patented invention in 1972 as recited above. Rather, Armak contends that the public use and sales prior to the critical date of April 1, 1973, were completely justified under the "experimental use" doctrine first recognized by the Supreme Court in *City of Elizabeth v. American Nicholson Pavement Co.,* 97 U.S. 126, 24 L.Ed. 1000 (1878). Armak argues that the 1972 public uses and sales were made under a "temporary permit" issued under Environmental Protective Agency ("EPA") regulations[6] which provided that such tempo-

5. While sales invoices were generated by Pennwalt at Tacoma, Washington; Montgomery, Alabama; Oakbrook, Illinois; and Bryan, Texas, all sales records for 1972 were destroyed except for the records found at Bryan, Texas (Tr. 944–45, 953).

6. The "temporary permit" regulations revised as of January 1, 1972 were issued under the authority of the Federal Insecticide, Fungicide, and Rodenticide Act ("FIFRA"), 7 U.S.C. § 135. FIFRA as originally enacted in 1947 required that all pesticides shipped in interstate commerce be registered with the Secretary of the United States Department of Agriculture ("USDA"). In addition, the Food and Drug Administration ("FDA") set tolerances for those pesticides that might leave a residue on food crops. Authority over the regulation of pesticides under FIFRA was transferred from the USDA and the FDA to the EPA on December 2, 1970, by Reorganization Plan No. 3 of

rary permits "will be issued only for bona-fide experimental programs under the supervision of qualified persons" (TX 185; 40 C.F.R. § 162.17 revised as of 1/1/72). Thus, Armak contends that since the 1972 public uses and sales of Penncap M were made by Pennwalt under an EPA experimental use permit, then *ipso facto* these public uses and sales fall within the experimental use doctrine under the patent laws and are exceptions to the statutory bar of 35 U.S.C. § 102(b). The Court disagrees.

[8] The "experimental use" doctrine, developed under U.S. patent law as an exception to the statutory bar of § 102(b), is not co-extensive with, and does not have the same meaning as, "experimental use" of pesticides conducted under an EPA temporary permit issued under our environmental protection laws. Experimentation under U.S. patent law is based upon policy grounds and for purposes wholly unrelated to, and different from, the underlying policy reasons and purposes for experimentation under federal environmental legislation. Under the facts of this case, neither the public use nor sale of the patented invention before the critical date can be considered "experimental use" under § 102(b) even though the use and sales made in 1972 were permitted by an EPA temporary permit issued for "experimental use."

The pesticide control legislation, represented by FIFRA and FIFRA–1972, was the result of congressional recognition that appropriate pesticides properly used are beneficial to man and his environment and also that many pesticides constitute poisons too dangerous for any use, that some are dangerous to the health of man, animals, bees and other useful insects unless used extremely carefully. Thus, realizing that pesticides have important environmental effects, both beneficial and deleterious, the statutory scheme was adopted to vest wise regulatory control upon all pesticides based on a careful balancing of benefit versus risk to man and his environment. Hence, at that time these regulatory acts required all pesticides, with certain exceptions, to be registered with the EPA before they could be generally distributed, sold, shipped, delivered or received by anyone. The EPA was to approve the registration of a pesticide if it were determined that (1) the pesticide warrants the claims made for it, (2) its label complies with legislation, and (3) it will not have unreasonable adverse effects on the environment. The applicant had the burden of proving these elements by test data and other relevant information. *See* 7 U.S.C. § 135 (now repealed); Pub.L. No. 92–516; Legislative History of Pesticide Control, 3 U.S.Code Cong. & Ad.News, 92d Cong., 2d Sess. (1972) at 3993–4134. In addition, the EPA was given the authority to issue temporary permits (TX 185; 40 C.F.R. § 162.17 regulations as of 1/1/72) or "experimental use permits" (7 U.S.C. § 136a), to an applicant to gather information necessary to convince the EPA to register the pesticide for general use. Thus, this pesticide regulatory legislation prohibited the sale or shipment of all unregistered pesticides, whether patented or unpatented, unless they were transferred under a temporary EPA permit. The focus of these laws and regulations was to protect the environment and had nothing to do with experimentation for patent purposes.

On the other hand, the experimental use doctrine in patent law has been explained in *Paeco, Inc. v. Applied Moldings, Inc.*, 562 F.2d 870 (3d Cir.1977), as follows:

> That doctrine allows an inventor a reasonable period of experimentation where-

1970, 35 Fed.Reg. 15623 (1970). On October 21, 1972, FIFRA was extensively amended by the Federal Environmental Pesticide Control Act, Pub.L. 92–516 ("FIFRA–1972"). FIFRA–1972 expanded the original FIFRA to cover pesticides in intrastate commerce and provided for the registration with the EPA of all pesticides to be distributed, sold or shipped, upon a showing that the pesticide warrants the claims made for it, its labeling complies with the Act, and it will not have unreasonable adverse effects upon the environment. In addition, the FIFRA–1972 provided that the EPA could issue "experimental use permits," if needed by an applicant to gather information in order to register the pesticide. (Pub.L. No. 92–516, Sections 3 & 5.)

> in he may perfect his ideas, provided that the inventor truly has utilized the public use and sale to that laudable end, not as a competitive tool to exploit his invention and gain an advantage over others.

562 F.2d at 874.

[9] This means that the public use and on sale bar of § 102(b) can be extended for a reasonable period if the experimentation is undertaken to demonstrate the utility of the claimed invention and its lack of need for further improvement. *DeLong Corp. v. Raymond International, Inc.*, 622 F.2d 1135, 1144 (3d Cir.1980). The claims of the '292 patent in suit pertain to an insecticidal-concentrate composition. Pennwalt's activity under the EPA temporary permit was in no way necessary to demonstrate the composition's "utility and its lack of need for further refinement." The utility of the composition had already been demonstrated. Each of the six batches of Penncap M suspended in xanthan gum produced in 1972 passed the cricket bioassay test (PX 504; PX 544; Tr. 746–47), as well as Pennwalt's other two quality control tests for those batches (PX 544; Tr. 747–49). The success of xanthan gum had been established as early as November 8, 1971, when Pennwalt concluded that RD–4237 was "effective." (TX 134 at Bates 01602.)

[10] Furthermore, to allow federal regulatory laws to control the patent law meaning of "public use" or "on sale" would result in a haphazard operation of the Patent Office. (Tr. 1552.) The objectives of the EPA and the Patent Office differ. A use or sale labeled "experimental" by a government regulatory agency is not necessarily "experimental" under the patent laws. As stated before, a claimed invention may be complete under the patent laws while remaining experimental in the regulatory sense. In those few cases which focus on this issue they have indicated this difference. For example, *In re Hartop*, 311 F.2d 249, 257–60, 50 CCPA 780 (1962), held that the utility of a pharmaceutical invention sufficient to premise patentability does not depend on absolute proof of safety. Proof of reduction to practice of a pharmaceutical invention does not require Food and Drug Administration approval or proof of commercial marketability. *Campbell v. Wettstein*, 476 F.2d 642, 646 (Cust. & Pat.App.1973); *In re Anthony*, 414 F.2d 1383, 1396, 56 CCPA 1443 (1969). The mere fact that an electrical device was sold before Underwriters Laboratory approval does not avoid the statutory bar of § 102(b). *Interroyal Corp. v. Summons Co.*, 204 U.S.P.Q. 562, 565–66 (S.D.N.Y.1971).

Armak also contends that the data gathered by Pennwalt of field tests under the EPA temporary permit indicates experimentation under the patent laws. The Court is again unable to agree. The experimental data collected by Pennwalt under the EPA temporary permit consisted of the results of spraying Penncap M upon crops in the field. The Penncap M user diluted the claimed composition many times. For example, controlling oriental fruit moth on peaches, the Penncap M temporary label recommended 1–2 parts Penncap M to 400 parts water (TX 186C at Bates 05703). For the control of tomato worms, the label recommended 1 part Penncap M to 100 parts water. At 1:100 dilution, the concentration of xanthan gum sprayed by the field user is 0.003%, far below the lower limit claimed in the '292 patent. (TX 201.) Even at the minimum 1:5 dilution suggested for insecticide concentrates by Dr. Scher, Pennwalt's expert (Tr. 1084), the concentration of xanthan gum is only 0.06%, still below the '292 claims. Certainly, any "experimental use" by field users in 1972 was outside the claims of the '292 patent.

[11] It is well settled that experimentation to perfect non-claimed features of an invention does not fall within the experimental use exception to the § 102(b) bar. *In re Theis*, 610 F.2d 786, 791 (Cust. & Pat.App.1979); *Gould, Inc. v. United States*, 217 Ct.Cl. 167, 579 F.2d 571, 582 (1978); *Carborundum Co. v. Combustion Engineering, Inc.*, 505 F.Supp. 1011, 1020 (D.Del. 1981).

[12, 13] However, there are other factors in this case which indicate that the

public use and sales of the claimed composition in 1972 were not for experimental purposes under § 102(b). Armak shipped over 400 pounds of RD–4237 to Pennwalt in 1972 knowing that it would be used to suspend Penncap M according to the claims in the '292 patent. Every witness examined on the subject testified that Armak did not restrict in any way Pennwalt's use of the RD–4237. (Tr. 129–30; 355–56; 489; 618; 716; 831; PX 908 at 66; PX 901 at 92.) The absence of any restriction by the patentee on the uses of a patented invention is indicative of a non-experimental purpose. *Egbert v. Lippman,* 104 U.S. 333, 336, 26 L.Ed. 755 (1881). To avoid the on sale bar the inventor must show that the transferee lacked authority to use the invention or exploit its commercial value but where an inventor sells or delivers an invention to another without any enforceable obligation for the other to hold the invention for experimental purposes only, the unrestricted sale or delivery will invalidate the patent. *Kock v. Quaker Oats Co.,* 681 F.2d 649, 655 (9th Cir.1982), *cert. denied,* —— U.S. ——, 103 S.Ct. 787, 74 L.Ed.2d 994 (1983).

[14, 15] Another factor that is indicative of non-experimental purpose is the failure to require test reports. *Carborundum Co. v. Combustion Engineering, supra,* at 1020, 1027. The evidence in this case clearly demonstrates that Armak did not require Pennwalt to report back to it any results of its use of RD–4237 (Tr. 129, 489, 716, 813). Where a person has authority to use an invention commercially or sell to others without any duty to experiment further, there is a sale within the meaning of § 102(b) and the experiment exception does not apply. *Kock v. Quaker Oats Co.,* 681 F.2d at 656.

The evidence also clearly indicates that Pennwalt's primary motive in seeking an EPA temporary permit to ship 40,000 gals. of Penncap M between March and December, 1972 (TX 146), was commercial in order to recover part of its development expenses and to test the market (Tr. 1329). The temporary permit itself indicates that only 1.2% of the allotted 40,000 gals. was to be supplied to researchers for the collection EPA data (TX 146; Tr. 1327–28).

Also, President Spooner of Agchem, a division of Pennwalt, advised the Pennwalt Executive Committee in 1972 that he was doing everything in his power to bring Penncap M to the market immediately (Tr. 677). It was Pennwalt's persistent objective to "make money" from sales under the EPA temporary permit, and to begin recapturing part of its research and development costs associated with Penncap M (Tr. 856, 1384). Manufacturing data from 1972 was also used to generate a cost-per-gallon figure (PX 711). Data collected under the temporary permit was used to set a sales price and gross marginal goal for Penncap M (TX 183 at Bates 04213; Tr. 637–38, 644–46). All of these activities demonstrate that Pennwalt was concentrating in 1972–1973 on the commercial aspects of Penncap M and did not involve any experimental aspects that would effect the on sale bar of § 102(b).

[16] It is well established that market testing and product introduction are not experimental uses. *Omark Industries, Inc. v. Carlton Co.,* 652 F.2d 783, 787 (9th Cir. 1980); *In re Theis, supra,* 610 F.2d at 793.

[17] A final factor indicates that the sales made in 1972 could not be considered experimental use to lift the bar of § 102(b). Pennwalt, not Armak, was the entity which caused the patented dispersion to be sold to Helene Chemical, Borden and Stauffer in 1972. The law is clear that the experimental use exception to the public use and on sale bar of § 102(b) applies to experiments of the inventor or persons under his control, not to third parties. *Magnetics, Inc. v. Arnold Engineering Co.,* 438 F.2d 72, 74 (7th Cir.1971); *Bird Provision Co. v. Owens Country Sausage, Inc.,* 379 F.Supp. 744, 747–48 (N.D.Tex.1974), *aff'd,* 563 F.2d 369 (5th Cir.1978). When the sales in question were made they were made by Pennwalt which was not under the control of Armak and even if Pennwalt's activities could be

considered experimental under patent law, they would not inure to Armak's benefit.[7]

Based on the evidence in this case, the Court finds that Pennwalt has demonstrated by clear and convincing evidence that the claimed invention was in public use and on sale in this country more than one year before the critical date of April 1, 1974. *Paeco, Inc. v. Applied Moldings, Inc., supra,* 362 F.2d at 872. The Court also finds that Armak has failed to sustain its burden of showing that such uses and sales were for experimental, not commercial, purposes by a preponderance of the evidence much less by full, unequivocal and convincing evidence. *Smith & Griggs Mfg. Co. v. Sprague,* 123 U.S. 249, 264, 8 S.Ct. 122, 129, 31 L.Ed. 141 (1887).

Accordingly, the Court concludes the '292 patent is invalid because the patented invention was in public use and on sale more than one year before the critical date in violation of 35 U.S.C. § 102(b).[8]

II. ARMAK'S STATE LAW CLAIMS

As indicated earlier, Armak has asserted state law claims contending that Pennwalt is liable for its profiting from Nemeth's invention which it alleges was a trade secret from mid-1972, when Pennwalt adopted its use, to mid-1978, when the Nemeth patent issued. (D.I. 128, p. viii.) This liability is alleged to exist for the breach of the 1963 Product Development Agreement between the parties and/or the unauthorized use by Pennwalt of the then trade secret and/or the resulting unjust enrichment of Pennwalt from the use of the trade secret which was then confidential information. (*Id.*). Because of the ambivalence of the parties' conduct and actions with respect to their dealings in this matter, additional facts must be considered.

1. *Background Facts*

Pennwalt entered the field of microencapsulation upon its acquisition of Wallace & Tiernan in 1969 and concentrated on encapsulated pesticides (Tr. 874–75). Methyl parathion was selected for encapsulation because its high toxicity would benefit from the toxicity reduction and slow release afforded by encapsulation (Tr. 875–76). Chester DeSavigny of Pennwalt was the inventor of Pennwalt's encapsulated methyl parathion product, Penncap M, which became the subject of U.S. Patent No. 3,959,464, issued May 25, 1976 (TX 166).

In May of 1970, Pennwalt's people recognized that Penncap M could not be used in the field in a water system without the addition of some suspending and/or emulsifying agents (PX 501; Tr. 1309) because the encapsulated material settled to the bottom and it was difficult to disperse it (TX 193, p. 38). Various persons at Pennwalt's facilities attempted to solve the suspension problem on a "hit or miss" approach but none were knowledgeable in formulation chemistry (Tr. 638–69; 1310; 1361–62), and the solution to the problem was without much success.

On February 4 and 16, 1971, Pennwalt's personnel, Obren Keckemet and Harry Culver, wrote to six companies for help in finding a suspending agent for Penncap M and sent them samples of unsuspended Penncap M: Woodbury Industries, Inc., Emery Industries, Inc., Retzloff Chemical Company, Witco Chemical Company, Inc., Atlas Chemical Industries, Inc., and Armour Industrial Chemical Company ("Armak") (TX 100). These companies were mostly surfactant[9] suppliers (Tr. 1280). This request for technical assistance from other companies was consistent with Pennwalt's past practices (Tr. 1300; 1310) and was, and is, a common practice within the chemical industry to render technical or customer

7. As will be discussed later, this was not a joint venture with Armak.

8. In view of the Court's finding of invalidity of the '292 patent based on 35 U.S.C. § 102(b), it is unnecessary to discuss Pennwalt's other grounds of invalidity.

9. A surfactant is a material which will move preferentially to the interface between oil and water phases, thereby lowering interfacial tension (Tr. 1075; 1077).

services when requested (Tr. 661–62; 770). Typically, a chemical supplier, at the request of a customer or potential customer, will analyze a customer's problem and suggest a specific material to be used with the customer's product free of charge (Tr. 716; 662; 1352; 1211). Well known as a selling tool, the technical service can develop sales of the supplier's material for use with the customer's product (Tr. 770; 716).

Pennwalt's request to Armak, as well as to the other five companies contacted, was for this customer service type of assistance. Pennwalt's request to Armak was directed to Dr. Walter W. Abramitis who was the Section Head of Armak's Agriculture Chemical Research and Pennwalt's contact with Armak in the agricultural chemical field (PX 901, p. 4; Tr. 1301). Part of Abramitis' duties for Armak was problem solving for customers, that is, "if a customer needed a specific product that he wanted, why, I would try to adapt our chemicals to his needs." (PX 901, p. 9.) Pennwalt had been since 1960 a customer of Armak buying hundreds of thousands of dollars annually of amides and surfactants (Tr. 682; 812).

When Culver of Pennwalt wrote to Abramitis on February 16, 1971 regarding Pennwalt's suspension problem, he specifically asked if Abramitis could "find a combination of those good Armour surfactants that will do the job." (TX 100.) Abramitis brought the problem to Sidney Shapiro, then assistant director of research for Armak (Tr. 196–98). Shapiro turned the problem over to Nemeth (Tr. 201; 66). Nemeth, on April 1, 1971, performed his first work in suspending the Penncap M samples received from Pennwalt (TX 103). Prior thereto, Armak had on hand a sample of "Kelzan" xanthan gum which had been ordered by Shapiro (Tr. 231). Kelzan had been used before by Armak as a thickener (Tr. 222).

Both Nemeth and Shapiro knew that gums were useful as suspension agents and Nemeth was led first to try Kelzan, an industrial grade xanthan gum, manufactured by Kelco Company (Tr. 97–100; 102; 253–54). Nemeth's April, 1971 experiment required him to weigh out the suspending agent into Penncap M, stirring the mixture with an agitator at room temperature, and observing the results 24 hours later (Tr. 105–106). Nemeth performed additional work in August and September, 1971, screening additional possible suspending agents (TX 129), the result of which indicated that besides Kelzan xanthan gum, which showed the best results (TX 105), other gums also worked as suspending agents (PX 13, 18; Tr. 533–42).

Sometime shortly after April 28, 1971, formulations bearing "TD" code numbers designated by Abramitis were sent by Armak to Pennwalt (Tr. 207; TX 106). Pennwalt analyzed these formulations also with others submitted by other companies and those generated by Pennwalt. Boiled down to specifics, it appeared by November, 1971 to Pennwalt that Armak's submission as RD–4237 appeared to be "really effective" (TX 134). At no time did Armak disclose to Pennwalt the chemical identity of RD–4237 as xanthan gum (Tr. 254–55).

In October, 1971, Keckemet learned for the first time: (1) that Armak was "asking for some kind of money compensation" for Pennwalt's use of RD–4237 (Tr. 1357), (2) that Armak was "applying for a patent for this material as a suspending agent and tentatively they intend to charge us royalties of $.07/gal., based on selling price of Penncap M if patent is issued, or $.04/gal. if patent is not issued (this in addition to cost of material)," and (3) that Armak "will be buying this material from another company" (TX 3). Nothing, however, was apparently mentioned of royalties until later.

In 1971, Pennwalt began producing Penncap M in a pilot plant at Bryan, Texas, which produced 20-gallon size batches (Tr. 899, 734). At that time Sponto 176, a suspending-emulsifying agent supplied by Retzloff Chemical Co., was used in producing Penncap M (Tr. 1310). Keckemet testified that Pennwalt selected Sponto 176 over Armak's RD–4237 because Pennwalt had more experience with Sponto 176, test data indicated that it was biologically and toxicologically safe, and Pennwalt did not know

whether RD–4237 would be cleared by the EPA whereas Sponto 176 had been so cleared (Tr. 1308, 1309, 1339–40).

In March, 1972, a full sized production plant came on stream at Bryan, Texas, capable of producing 750 gallon batches (Tr. 898). The first full-size production batches of Penncap M used Sponto 176 but problems resulted: the Penncap M settled and became non-pourable and more seriously, the methyl parathion began leaching out of microcapsules into the surrounding aqueous phase (Tr. 935, 924). As a result of these problems during production, Pennwalt in July, 1972 stopped using Sponto 176 and switched to Armak's RD–4237 agent and the first batch so run was on July 18, 1972 (PX 508, Tr. 922–23; 936).

After July 18, 1972, all of Penncap M was produced using RD–4237 as the suspending agent and Armak had knowledge of this and indeed had shipped an additional 400 pounds in July and August, 1972 for these runs. (D.I. 99, ¶¶ 3.24 & 26.) It was then on August 4, 1972, that Roy deVries, Armak's Director of Marketing, wrote to Robert Toth, Agchem's newly appointed General Manager, suggesting that the parties "should sit down and come to some agreement on the terms under which we would be prepared to arrange this." (TX 18.) Toth responded that "he would confer with Pennwalt's technical and manufacturing people" and that "[w]e should sit down and discuss the agreement as soon as we determine the future of your product." (TX 19.) Toth testified he meant by "future of your product" from a business standpoint rather than a formulation standpoint. (Tr. 838.) Pennwalt was then beginning a "test marketing program" and it appeared to Toth that Armak knew that Pennwalt was using RD–4237 in that program. (Tr. 836–38.)

Next, on November 22, 1972, G.F. Smitskamp, Vice President of Armak, wrote to Toth raising three points: (1) a possible agreement on the suspending agent for Penncap M, (2) a possible agreement concerning third party investigations of unpatented products submitted by Armak to Pennwalt, and (3) when Armak should file for foreign patent applications on Penncap M's suspending agent and whether Pennwalt would be willing to pay for the filings. (PX 540.) Toth responded on January 8, 1973 that the decision to file in foreign countries and the expense was up to Armak. (TX 25.) Toth testified that his response to the possibility of royalty payments in his letter to Smitskamp referred to possible royalty agreements in foreign countries if Pennwalt decided to market Penncap abroad. (Tr. 799–800.)

Toth met with Armak representatives on March 27, 1973, and expressed an unwillingness to discuss a royalty until Armak's patent status was determined (TX 28). Toth stated that, once Armak produced a patent for the suspending agent, he would forward it to Pennwalt's patent department for review (Tr. 801).

Smitskamp testified that during a telephone call he made to Toth on April 24, 1973, Toth agreed that any royalty agreement eventually reached would be retroactive to include all RD–4237 shipments beginning in April, 1973. (TX 29A; Tr. 457.) Smitskamp also testified he told Toth that if the royalty agreement was not made retroactive, the 300-pound shipment now on the loading dock would not be delivered to Pennwalt (Tr. 457). Toth recalled the conversation but not the threat to cut off the supply of RD–4237 or that he agreed to retroactivity of any future royalty agreement; he did recall telling Smitskamp that Penncap M was being test marketed to determine how the product was accepted at proper selling price. (Tr. 802.) Smitskamp offered to send a royalty agreement and Toth replied, "Fine send me an agreement, send us a draft, and we'll take a look at it." (*Id.*) Smitskamp sent Toth a confirmatory letter on April 25, 1973 stating, "we are proposing a royalty of 7% on the value of your finished product," that he appreciated Toth agreeing to the retroactive condition, and that he would submit a Licensing Agreement. (TX 29.) Toth never responded to this letter. (Tr. 846.)

On August 3, 1973, Kelco Company at Pennwalt's request reverse-engineered a

sample of Armak's RD–4237 and determined its identity to be xanthan gum that was well within the specification range of Kelzan [10] (TX 31). The identity of RD–4237 was confirmed when Shapiro wrote to DeSavigny on June 18, 1974, confirming that Armak would supply Pennwalt with 6,000 pounds of RD–4237 at 600 pounds per month starting October 1, 1974, and by error included a shipping order to that letter which identified RD–4237 as Kelzan (PX 510).

In April 1974, Pennwalt received the draft royalty agreement from Armak which had been promised the year before. Toth expressed a willingness to buy xanthan gum from Armak under a resale agreement if Armak's price was competitive (Tr. 818–19; TX 42). Throughout 1974 Armak insisted its patent would issue and Toth maintained Pennwalt's position that there would be no negotiations until the patent issued and was reviewed by Pennwalt's patent department (Tr. 820–21; 841–42).

No further negotiations took place until President Spooner of Agchem met with Armak Vice President F.L. Linton on May 23, 1978, and for the first time Armak asserted that the Product Development Agreement ("PDA"), dated November 26, 1963 (TX 80), controlled the question of royalties for Pennwalt's use of RD–4237 (Tr. 648). Further negotiations were fruitless and this lawsuit was filed on March 26, 1979.

When Pennwalt learned independently of Armak that RD–4237 was Kelzan xanthan gum, Pennwalt elected to discontinue buying Kelzan from Armak. (D.I. 99, ¶ 3.23.)

2. *The Product Development Agreement*

The predecessors of Armak and Pennwalt began their cooperative efforts in the field of agricultural chemicals in the late 1950's (Tr. 404) and this eventually resulted in the execution of the PDA, dated November 26, 1963. (Tr. 407; TX 80.) The intent of the PDA was to complement the respective strengths of the two companies as the recitals of the agreement show:

> 1. The purpose of this agreement is to establish a basis for cooperation between PENNSALT and ARMOUR and *the field for this cooperative effort shall be the development of pesticides,* to include, but not limited to, insecticides, fungicides, herbicides, rodenticides, plant growth regulators, nematocides, and harvest aid chemicals.
>
> 2. *ARMOUR has developed chemicals and formulations showing possible pesticidal activity* and is continuing research and formulation development on products of this type. It is desired to have these materials tested further in laboratory, greenhouse, and the field in order to develop said products to commercial usage.
>
> 3. PENNSALT has pesticide development personnel and facilities and desires to screen and test these chemicals and formulations for *pesticidal activity* for the purpose of developing additional pesticides which may be marketed by PENNSALT in the United States and in foreign countries.

(TX 80; emphasis added.)

Armak contends that the submission of RD–4237 (xanthan gum) to Pennwalt was pursuant to the PDA and thus Pennwalt is obligated to enter into a licensing agreement and pay royalties thereunder. Pennwalt's failure to do so, Armak argues, amounts to a breach of the PDA. Mr. Karl Bierman, a former Vice President of Armak, and Mr. Richard Reck, Armak's Director of Commercial Development, testified that it was their opinion and belief that the PDA clearly embraced Armak's submission of RD–4237. (Tr. 418–19; 501.) Their testimony is flatly contradicted by the testimony and other witnesses which will be hereinafter discussed.

[18] Faced with such contradictory testimony, courts turn, as an important aid to the construction of a contract, to examine

10. In November and December, 1972, DeSavigny, reporting on a study he made of suspending agents, came to the belief that RD–4237 was xanthan gum because it behaved in physical characteristics as General Mills XB23 and Kelzan which he had tested and knew were xanthan gums (PX 522; Tr. 955–56).

the practical construction placed on the agreement by the parties themselves. *American Bemberg Corp. v. United States,* 150 F.Supp. 355, 361 (D.Del.1957), *aff'd,* 253 F.2d 691 (3d Cir.), *cert. denied,* 358 U.S. 827, 79 S.Ct. 45, 3 L.Ed.2d 67 (1958); *see Canister Co. v. National Can Corp.,* 71 F.Supp. 49, 50 (D.Del.1946), where Judge Leahy adopted the wisdom of Lord Chancellor Sugden in *Attorney General v. Drummond,* 1 Drury & Warren 353, 368, "Tell me what you have done under a deed, and I will tell you what that deed means." This advice is particularly applicable to this case.

First, the above recitals of the PDA refer to Armak's submission of an *active* pesticide or to the submission of an Armak chemical which *chemically reacted* with a Pennwalt compound to create an active pesticide. Here the submission was xanthan gum which is an "adjuvant"—an inert ingredient in a pesticide formulation which improves the physical characteristics of the formulation, but does not react chemically with other components of the formulation. (PX 908 at 61–62; PX 901 at 19; Tr. 216, 220.)

Second, the first license agreement between Pennwalt and Armak which arose under the PDA related to an amine-endothall salt. (TX 67.) Pennwalt's endothall herbicide was chemically reacted with Armak's patented amine, resulting in herbicidal salt which produced a more active product than Pennwalt's endothall herbicide. (Tr. 508, 688.)

Third, the amine-endothall license agreement was premised on Armak's patent or pending patent applications and absent the patent, Pennwalt would not have entered into the license agreement (Tr. 694–96). All later submissions of Armak under the PDA included *active pesticides* and each agreement arising therefrom was in the form of a patent license (Tr. 686–87). No licensing agreements between Pennwalt and Armak were ever directed to inert substances and Pennwalt never paid a royalty to Armak for an inert adjuvant (Tr. 687; PX 901 at 38).

Fourth, from 1972 through 1974, Smitskamp, Armak's Vice President, was actively seeking Pennwalt's agreement to pay a royalty on RD–4237, but at no time did anyone at Armak refer to the PDA as a basis for such an agreement (Tr. 488–89). It was not until after Linton became Vice President of Armak's Chemical Division and on May 23, 1978, that the PDA was ever mentioned with respect to RD–4237 (Tr. 648).

Fifth, another indication that the parties did not believe the PDA was applicable to RD–4237 is the fact that Section 4 of the PDA was not followed by Armak. Section 4 provides, in part:

> Each company will keep its own invention records and seek its own patents, *and will keep the other party fully informed of the patent application status* of each of its inventions relating to pesticide chemicals covered by this agreement.

(TX 80; emphasis added.)

In 1965, patent counsel for the parties reached an understanding as to how the parties would operate under this provision; Armak was to furnish drafts of Armak's patent applications to Pennwalt for comment before filing in the Patent Office. (PX 513 & 515.) However, no part of three Nemeth patent applications leading to the '292 patent were ever revealed to Pennwalt, apart from the allowed claims of the issued patent in 1978 (Tr. 654–55). Had Armak believed that the PDA covered RD–4237, the three applications would have been submitted to Pennwalt before filing.

Finally, Section 3 of the PDA required Armak to release to Pennwalt the identity of all material submitted for testing upon request of Pennwalt. That provision reads:

> SECTION 3—LIMITATIONS
>
> 1. ARMOUR will release the chemical identification of compounds or other data on materials when submitted to PENNSALT for testing in accordance with Secrecy Agreement Letter dated February 17, 1961 [TX–70] and the supplemental letter of March 30, 1961 [TX–72] from L.M. Miller of ARMOUR to J.D. Watson of PENNSALT.

Although repeated requests by Pennwalt were made, Armak never revealed the identity of "RD–4237." Pennwalt asked Abramitis of Armak for the identity of RD–4237 on the following occasions: May 3, 1971 (TX 109); August 2, 1971 (TX 177); November 3, 1971 (TX 8); and during a November, 1972 meeting in Tacoma, Washington (TX 21 at Bates A006229; Toth 794–95). According to the testimony of Armak's witness Bierman, if RD–4237 was covered by the PDA, its identity should have been disclosed to Pennwalt. (Tr. 432–33.) This is simply another example of Armak's conduct which leads to the conclusion that PDA did not apply to RD–4237.

[19] Accordingly, having considered and weighed the testimony of the witnesses, the documentary evidence, and the conduct of the parties, the Court concludes that RD–4237 (xanthan gum—an inert adjuvant) was not within the scope of PDA and therefore the PDA affords no basis for holding Pennwalt liable for damages for breach of express contract.

3. *Implied Contract or Unjust Enrichment*

[20] Armak contends that it is entitled to a finding that Pennwalt is liable to it upon either of two alternative theories: (1) breach of contract implied from the unauthorized use of its trade secret, or (2) unauthorized use of its trade secret unjustly enriching Pennwalt.

The difficulty in applying these two theories to this case is the lack of proof by Armak of a factual basis necessary to support those theories.

The Court is convinced by the credible evidence that on February 16, 1971, when Pennwalt first requested Abramitis of Armak, as well as the other five chemical companies, for help in solving Penncap M's dispersion problem, it was seeking free technical or customer services. This was a common practice in the chemical industry. Pennwalt had been a long time customer of Armak and it hoped that Armak's "good surfactants" could solve its dispersion problem with Penncap M. Pennwalt believed that Armak would benefit by its sales to Pennwalt. Indeed, Armak provided customer services regularly to others. Nemeth, who spent about one-half of his time between 1966 through 1979 on technical services activities (Tr. 101), never knew of an occasion when Armak attempted to charge a customer for technical services except for RD–4237. Shapiro, Nemeth's superior, testified that technical or customer services were usually compensated by sale of their products (Tr. 214–15; 218). Abramitis handled between 5 to 10 technical service requests a year during his 30-year tenure with Armak and he never once charged for such services or was aware of charges by Armak for such service to customers. (PX 901 at 10.)

Furthermore, when Armak shipped the coded samples of xanthan gum-suspended Penncap M to Pennwalt on April 28, 1971, Armak never indicated that compensation was expected, never placed any restrictions or controls over the use or disclosure of the materials, and never indicated that Armak was establishing some kind of confidential relationship with Pennwalt with respect to its request for help. Indeed, Armak remained silent in this regard while Pennwalt tested the samples, acquired more RD–4237 from Armak, and voluntarily reported back the "good results" in June 1971. While it is true, that the identity of RD–4237 was not revealed at that time or any other time intentionally by Armak, the purpose and use of the material was certainly disclosed because it was prepared and shipped in response to Pennwalt's request for specific technical services. The "benefit" conferred on Pennwalt and the "service performed" by Armak was completed when Pennwalt was sent the dispersion material on April 28, 1971. An uncommunicated expectation of remuneration at the time services are performed does not give rise to an implied or quasi-contract when Pennwalt had no reason to believe that compensation was expected for that service. *See Bloomgarden v. Coyer,* 479 F.2d 201, 202 (D.C.Cir. 1973).

Equally important is the fact that in April, 1971 Armak did not indicate that by responding to Pennwalt's request for customer service, Armak was attempting to establish a confidential relationship. If this was Armak's intent, it should have put its customer Pennwalt on notice of this condition. The Court is convinced that Armak did not do so at that time because it considered its help to Pennwalt to be free customer service. It was not until October, 1971, as a complete afterthought, that Armak decided to file a patent application and tentatively to seek some form of royalty (TX 3).

After Pennwalt began to manufacture and sell larger batches of Penncap M suspended in RD–4237 in July and August, 1972, of which Armak was aware (TX 22) having shipped an additional 400 pounds to Pennwalt at Bryan, Texas, and it having appeared that Penncap M would have an excellent commercial future, Armak then began to agitate for an agreement with Pennwalt for the payment of royalties. Apparently, Armak, through Smitskamp and Linton, was seeking an *Aronson*-type contract [*see Aronson v. Quick Point Pencil Co.*, 440 U.S. 257, 99 S.Ct. 1096, 59 L.Ed.2d 296 (1979)], whereby Pennwalt would agree to pay certain royalties if a patent issued to Armak and lower royalties if a patent did not issue, and to pay such royalties retroactive to April, 1973. These specific requests for royalties caused Pennwalt to take the position, which it has consistently maintained ever since, that it would only pay royalties if Armak obtained a valid patent on Penncap M's suspending agent.

These conflicting positions of the parties do not give rise to any expressed or implied contract to pay royalties for services which the parties originally considered and treated as ordinary free customer services.

In any event, even the identity of RD–4237 was no longer a secret after August 3, 1973. At that time, Kelco Company by reverse engineering had determined at Pennwalt's request that RD–4237 was xanthan gum and probably Kelco's own Kelzan (TX 31). Trade secret law, even if it were applicable here, does not afford protection against discovery by fair and honest means, such as independent invention, accidental disclosure or reverse engineering. *Kewanee Oil Co. v. Bicron Corp.*, 416 U.S. 470, 474, 94 S.Ct. 1879, 1882, 4 L.Ed.2d 315 (1974).

Moreover, on the proof adduced in this case, no confidential relationship existed between the parties on the RD–4237 issue. Their relationship with respect to RD–4237 began with a customer's request for technical services from a supplier. The technical services were given to Pennwalt without restrictions on its use or disclosure, nor was it stated to be in confidence. Thus, the Court finds that the necessary elements for a recovery against Pennwalt based on a trade secret has not been demonstrated. The Court therefore concludes that Armak has not established Pennwalt's liability on the theory of breach of implied contract or unjust enrichment.[11]

III. ATTORNEY'S FEES

Pennwalt, in seeking reasonable attorney's fees on the basis that this is an "exceptional" case within the meaning of 35 U.S.C. § 285, advances two grounds: (1) Armak successfully opposed Pennwalt's summary judgment motion thereby forcing Pennwalt to incur far larger attorney's fees in proceeding with a bench trial than would have resulted if it had been disposed of by summary judgment, and (2) Armak intentionally practiced fraud upon the Patent Office during the prosecution of the three patent applications leading to the issuance of the '292 patent.

[21] First, the Court finds no merit to Pennwalt's first ground. There were genuine issues of material fact in dispute which could not be resolved by summary judgment thereby requiring a bench trial to resolve the disputed facts. The Court can-

11. Because of this ruling, it is unnecessary for the Court to pass on Pennwalt's affirmative defenses that Armak's state law claims are barred by the statute of limitations, and doctrine of laches, waiver and estoppel.

not attribute bad faith to Armak for opposing plaintiff's summary judgment motion.

[22] Second, the Court has found the '292 patent to be invalid under the "in public use" and "on sale" bar of 35 U.S.C. § 102(b). It has also intentionally refrained from passing on all of Pennwalt's claims that the '292 patent is unenforceable on the ground that fraud was practiced on the Patent Office. The Court sees no need to "beat a dead horse to death" in order to determine that the '292 patent already found to be invalid is also unenforceable because of fraud. Therefore, without specifically deciding whether all of Armak's alleged acts amounted to fraud, the Court does find that the prosecution of the three patent applications leading to the '292 patent leaves much to be desired and that the conduct of Armak before the Patent Office was less than candid. The fact that this Court has invalidated the patent based on the statutory bar of § 102(b) creates the suspicion that had the relevant facts been disclosed in the beginning, the Patent Examiner would not have issued the patent. However, Armak has made a showing that it sincerely believed that the "experimental use" under the federal environmental laws could be equated with "experimental use" under the patent laws so as to take the case out of the § 102(b) bar. While this bona fide belief, which was not disclosed to the Patent Office, falls short of standards required for patent practice, nevertheless, it was sufficient to support a good faith belief in the patent's validity. Consequently, based on this finding, the Court, in the exercise of its discretion, holds that this case is not "exceptional" for the purpose of requiring Armak to pay Pennwalt's attorney's fees under 35 U.S.C. § 285. *See Union Carbide Corp. v. Borg-Warner Corp.*, 550 F.2d 355, 362–63 (6th Cir.1977); *Indiana General Corp. v. Krystinel Corp.*, 421 F.2d 1023, 1033–34 (2d Cir.1970), *cert. denied*, 398 U.S. 928, 90 S.Ct. 1820, 26 L.Ed.2d 91 (1970).

This opinion shall constitute the Court's findings of fact and conclusions of law required by Rule 52(a), Fed.R.Civ.P.

Judgment will be entered in accordance with this opinion.

Frances E. BELL

v.

John C. BRENNAN, et al.

Civ. A. No. 83–1185.

United States District Court,
E.D. Pennsylvania.

Aug. 22, 1983.

Civil rights action was brought. Defendants moved to dismiss. The District Court, Giles, J., held that complaint alleging that plaintiff was erroneously issued citation for reckless driving after being involved in collision with automobile being driven by police officer failed to state claim for relief under federal civil rights law.

Motion granted.

1. Civil Rights ⇐13.12(5)

Count in complaint alleging that plaintiff was erroneously issued citation for reckless driving after being involved in collision with automobile being driven by police officer failed to state claim for relief under statute prohibiting discrimination based upon race where there was no allegation that plaintiff was treated unfairly and unequally on account of her race. 42 U.S.C.A. § 1981.

2. Civil Rights ⇐13.12(7, 8)

Valid cause of action under section 1983 is not made out simply by asserting that common-law tort was committed by state official; rather, plaintiff must allege deprivation of some constitutional right under color of law. 42 U.S.C.A. § 1983.